

Final Report: Using HTML to Design and Utilize Interactive Learning Guides in Audio Production Courses

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Using HTML to Design and Utilize Interactive Learning Guides in Audio Production Courses
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Abstract:

This project is an HTML-based interactive learning guide for the channel strip of an analog audio console. A very important skill for students studying audio production, recording and engineering is to understand the signal flow of an audio console. Much of learning the entire console is understanding the function and signal flow of the mono channel strip. The channel strip is the first signal input of the console and handles many of the essential functions of signal processing while recording and mixing.

The purpose of this project is to demonstrate how HTML, CSS and JavaScript can effectively be used to design functional interactive learning guides that can be used to supplement textbooks used in audio production classes and also act as reference material for students enrolled in those classes. The prototype has been built to replicate the information found in a six-page pdf file from a manufacturer's website. The same information has been duplicated for the controls of a channel strip in an HTML5 model so that users can mouse over each control to read about its specific function. Further developments would likely replace a control's text "hotspot" with a video tutorial that would launch when that control is scrolled over with a mouse.

A review of the literature shows that there have been an increasing number of similar projects within the last 5 years in an attempt to teach "signal flow" in these courses. Much of the findings were from the Audio Engineering Society (AES) anniversary conference in 2013 as well as the Music and Entertainment Industry Educators Association since 2006. Additionally, most tutorials found online for this type of equipment exist in the form of either videos, which range

from professionally produced videos by manufacturers to shaky cell phone versions shot in bedroom studios, or online courses. There are online learning sites such as Lynda, Udemy and others that offer short tutorials and full video courses in audio production and its various related components such as recording, mixing and mastering. Most of these courses, in addition to requiring some form of paywall, usually gloss over the very essential components that comprise an audio console and skip directly to the capabilities of Digital Audio Workstation (DAW) software which is so commonly used in today's audio production processes.

A project timeline is included which discusses the latter stages of this project since it was created in a previous academic semester. This timeline will include estimated timelines for including additional and alternate content, such as the previously mentioned video elements and creation of a virtual channel strip model in place of the HTML version that has been developed. Also included in the timeline is the initial pilot study which will also be analyzed and addressed within this paper.

Introduction:

Channel strips typically contain an input or preamp section that can be switched between Microphone Level, Instrument Level or Line Level signals coming into the channel. Additionally, the strips typically will have a section for routing those signals to various sources such as a recorder, Digital Audio Workstation (DAW) interface or a patch bay connected to various "outboard" equipment such as compressors or reverb units that usually return to the channel strip or another section of the console. The next key component of a channel strip is the Equalizer or EQ to adjust bass, midrange and treble frequencies of a signal. Lastly, there is a

vertical fader or series of faders that will allow fine adjustment of signal levels and panning between left, center and right of the audio signal in a multi-channel mix.

Most consoles are comprised of multiple identical monophonic channel strips in multiples of fours or eights: four channel, eight channel, twelve, sixteen, twenty-four, thirty-six, and so on.

While consoles have evolved from large “desks” filled with tubes and transistors to computer touch screens and smaller digital fader computer interfaces, analog consoles are still favored in education due to their simplicity in understanding signal flow in a linear manner.

Most higher education programs in music business, audio production or recording industry studies need to supplement common textbooks written for audio production with hands-on instruction of the equipment that is installed in their institution. As Timmy Tappan of Belmont University points out “Today’s contemporary recording process now employs an amazing repertoire of technology that controls an extraordinary array of audio elements.” (Tappan, 2011) This expansive array makes it impossible for any text author to include every possible combination of equipment used from one studio to another in a given volume. Unless textbook authors create their texts as online versions where a faculty member could pick and choose specific equipment materials or have companion websites for the text, which more are doing when writing texts that are based on recording technology, there is no opportunity to address multiple options for various studio equipment in written textbooks. This project could serve as an example for such equipment-specific interactive materials.

One of the more commonly used supplements for those students who are self-learners or seek additional technical information are the user’s manuals for the given console that the students will be using. These are commonly distributed as either printed material that is placed in a

binder and kept in the control room or uploaded to an educational portal such as Canvas or Moodle for students to download for review.

In the case of the console used for this project, the Audient ASP 4816, the user documentation available on the manufacturer's website was originally written as documentation for their larger console, the ASP 8024. This was the case until the spring of 2017. This could be confusing to students who would consult the manual and online documentation because there were additional controls listed in the documentation that were physically not part of the 16 channel version of the console. This is partly the reason that this particular console was chosen for this project. The other primary reason being that the author of this paper maintains two studios that were until May of 2017, both furnished with Audient consoles.

It is not new that institutions of higher education that teach audio production at any level have sought supplemental materials, tutorials and new ways to teach signal flow to their students. Nor is it new that many of the supplemental materials available for any console or other piece of audio equipment that the materials that are provided by the manufacturer tend to be written with installation engineers and professional engineers as their target audience and are filled with technical jargon and schematic drawings which take training to read and understand. These documents are not designed to be educational texts and often require a knowledge beyond that of the beginning learner of this area of study who is often encountering their first analog console.

Purpose:

The purpose of the project is to demonstrate how HTML5, CSS and JavaScript can effectively be used to design functional interactive learning guides that can be used to supplement textbooks

used in audio production classes and also act as reference material for students in those classes. This project is designed as an interactive learning guide for teaching the signal flow of an analog audio console, starting with the most basic and versatile in function of the console's components, the channel strip. In today's growth of music technology in higher education, all practitioners and educators are charged with understanding, utilizing and teaching some form of audio production, even if it is as simple as teaching a student to record themselves on a laptop using a USB microphone or handheld recorder. The greater the understanding of signal flow from the origin of sound from an acoustic or electric instrument through a transducer whether it be a microphone or amplifier and through electronic components to its destination, the more successful a musician or audio engineer will be in producing a product that is of usable quality and better communicate their musical ideas and performances. This comes at a time when many texts and educational labs used for teaching audio production have shifted towards the use of Digital Audio Workstation (DAW) software such as ProTools, Logic, Ableton Live and others. In the 2006 MEIEA Journal, Barry R. Hill of Lehigh Valley College warned in his paper "Traditional analog (audio) systems are physical devices, providing tactile and visual representations of operational procedures; novice engineers can thus more easily "see" the underlying schemes of operations." (Hill, 2006)

The purpose here is to create a virtual version of a user's manual that is more appealing to students who are tech savvy, something that looks and virtually feels more like an analog console than a printed text in black and white, reinforcing what students can "see" in the physical device and the model. Gabe Herman pointed out in his AES Journal paper "For many schools and institutions, providing enough access to lab or studio space where students can

safely experiment and practice routing configurations outside of class is a difficult administrative task”. Herman goes on to point out that there is no current software available to teach signal flow when writing about his own research in creating a virtual environment for teaching signal flow.

“The development of this virtual tool could also be useful in teaching students complex audio systems in distance-learning environments where physical time in a studio classroom may be limited. To date, there has been no such marketed software to address this need.” (Herman, 2013)

This project is an HTML5 based interactive learning guide specifically the ASP 4816 from Audient. One of the leading manufacturers of middle-class analog consoles used in education and professional studios alike, Audient is based in the U.K. Audient consoles are true analog inline consoles with both input (mic/instrument/line or playback) and output (tape or Digital Audio Workstation) signals controllable within the same channel strip. The Audient consoles are increasingly being installed in higher education institutions that teach audio production and music technology, such as Swiss SAE Institute in Zurich, Academy of Sound Engineering (ASE) in Cape Town, South Africa, The University of West London, University de Montreal, Butler University, and Indiana University (www.audient.com, 2017) and therefore make the Audient ASP 4816 a representative console to design this tutorial around for the music technology education market.

The learning guide could be uploaded as a module to any instructional site such as Canvas, Moodle or any web server as has been done for the initial pilot survey. Because it is designed in HTML5, it can also function from a desktop folder in any web browser such as Google Chrome or Safari without an internet connection provided that the folder is zipped and properly unzipped to include the associated image files along with the html file. This stand-alone

functionality makes it suitable for students to use in virtually any environment and as Herman pointed out, distance learning situations as well. The channel strip module as it stands can be expanded to be an interactive guide or series of guides for the entire console with additional development of those sections.

The limitations of this guide module are simply the time and expertise needed to further develop it from the existing prototype. For example, vertical faders are common on audio consoles, but they are a challenge to even professional programmers to create in HTML5 using CSS and JavaScript. This is evident in the current prototype. When a “thumb” for the slider was styled to look like the fader knob in the “Long Fader” section of the tutorial, it lost functionality and therefore was returned to a slider that functions but is less realistic.

The delimitations of this project are that educators could choose which developed content (video, Max, etc.) that they elect to use in their teaching. Since this guide is authored in HTML, it is relatively simple for anyone with coding experience to comment out links to videos or re-establish the links if those features are to be made available at a later time. For some music educators, there may not be a desire or need for a beginning musician to do much more than turn a microphone signal into a line level signal that can be recorded, while more production-oriented students may need to learn not only basic signal routing exercises such as compression and reverb, but other common skills as setting up a fold-back signal for headphone listening in the adjacent recording studio. This is where supplemental videos add to the functionality of the guide when desired.

Review of the Literature

There are numerous resources when it comes to video tutorials, but interactive, mediated HTML tutorials for learning a console of this class are limited. The natural starting point for the Audient ASP 4816 is the company's website www.audient.com. As late as March of 2017, the documentation available for the 4816 was actually the pdf user's manual for the ASP 8024, the larger predecessor to the 16 channel console. This was confusing for beginning students as the documentation was inaccurate, when compared side by side to the console, showing knobs and buttons that were not a part of the newer smaller console. This documentation has since been updated, which would provide additional resources for the continued development of the interactive tutorial (Appendix 3). Additionally, Audient has created a Youtube channel where they post their own interviews, promotional materials and some video equipment reviews and overviews.

A YouTube search for other demonstration videos of channel strip hardware and software range from amateur users demonstrating inexpensive software plug-ins that mimic channel strips found in middle and state of the art classed consoles to professionally produced overviews from either the manufacturers of these consoles, resellers such as Sweetwater.com or those fortunate enough to own them or work with them professionally on a regular basis. As with any multi-media production or supposed instructional video, production quality also varies greatly from clip to clip.

There are very few videos available from textbook publishers on the subject of audio production or signal flow. Sage Video lists one title in their current offerings which is a thirty-minute interview with Alan Barker about Sound for Film. (Appendix 1). One professionally produced series of videos that institutions have added to their libraries in recent years is Alan Parsons' "Art and Science of Sound Recording" from Keyfax New Media. The DVD set covers all aspects of recording and does include a section on consoles which includes channel strips taught by the band leader and famed recording engineer behind Pink Floyd's "Dark Side of the Moon". Due to the success of the initial DVD series in audio production education, Keyfax has released a companion book and a program to deliver the video content in an educational institutional release where access licenses are purchased to access the content on multiple workstations.

A similar, yet less in-depth video tutorial series has been launched by Groove3 and features courses from famed recording engineer Dave Pensado, noted for working with Michael Jackson among other artists and host of his Pensado's Place web videos. Pensado's videos are listed under the heading of "Pensado's Into the Lair". Groove3 has also partnered with John McBride, owner of Blackbird Studios in Nashville, TN and Hal Leonard Publishing to create the Blackbird Academy and Hal Leonard video tutorials sold through the Groove3 website. This series is aimed at the amateur to intermediate level student of audio production and offers very basic overviews of the phases of audio production in short videos. Learners can pay per course title such as "signal flow" for a low fee of \$6 per course or there is a \$15 "all access pass" that grants the subscriber access to all of the Blackbird Academy videos on the Groove3 site. It appears that although there are supposed to be fifteen courses in the Blackbird Academy series, for

example only the first eight have been published online and the most recent one was launched in the fall of 2016.

Many of the leading distance educational sites, such as Lynda.com, Udemy, musicstuts.com and Puremix.net offer some free tutorials or trial periods then require subscription, enrollment or other fees from users. In the case of Lynda.com, there are “eighty-five plus” music production courses. The majority of these are software based, teaching audio programs like Max, Ableton Live, Reason, ProTools and Logic and therefore have limited relevance to the interactive channel strip guide that is being proposed here. After registering for Udemy, there was one course on recording drums that contained a channel strip overview. This overview was for a mixing console from Solid State Logic that retails for twice the price of the Audient used for this project. Most other tutorials including the ones found on Udemy and Lynda simply show the entire console as a generic “audio interface” in a signal diagram or flowchart. While this makes sense in the overall production chain to an experienced user, it is insufficient information to use as a source for teaching the novice. Berklee Online tutorials are only available to students enrolled in their online courses.

The vast majority of tutorials focusing on signal flow, including those at the musicstutsplus.com and puremix.net websites concentrate on the signal path in DAW programs or audio plug-ins. Commonly known as the digital signal flow, these tutorials often ignoring the analog processing that started with capturing sound with a microphone and amplifying it through a preamp and channel strip to a signal that was usable by that software.

Due to the newness of the Audient 4816, which has only been in production for the last four years, existing audio production textbooks and many overviews use other consoles, usually

either in the prosumer class (Mackie, PreSonus, Yamaha) or the high-end professional class such as Neve or Solid State Logic. Mid-priced analog consoles such as the Audient are often overlooked simply because of the abundance of analog and digital consoles available for less than ten-thousand dollars. High end consoles are commonly represented partly because their manufacturers have more money to spend on high quality videos, marketing and instructional materials.

An increasing number of educators have sought to develop new ways of teaching audio signal flow using software that is readily available to most faculty in higher education. This review found two such recent papers written for the Audio Engineering Society's 50th International Conference in 2013. The first and the one that most closely matches this project was written by Gabe Herman from the Hart School at the University of Hartford in Connecticut. His work concentrated on teaching the signal flow of an analog console in a virtual software environment. For his model, Herman used Apple's Keynote to build a virtual model of a NeoTek Elite console that would change the signal's flowchart based on what virtual button was depressed in the model. (Herman 2013)

A similar but different approach was taken by Ian Z. Anderson, then teaching at Butler University, now at the Kent State University at Stark in Canton, Ohio. Anderson's focus was on teaching circuitry signal flow using Prezi to simulate a "black box". Anderson treated the black box on micro, mid and macro levels ranging from any piece of equipment to series of pieces of equipment where there was an input, a process within the black box and an output. In this model, a channel strip or console could be a black box at the micro level, but so could a full

studio or even the production chain from recording to mastering of a compact disc at the macro level. (Anderson, 2013)

What Anderson and Herman shared in their purposes behind their research is twofold and the same driving purposes behind this project- to find a more effective way to teach signal flow and a way for students to have virtual access outside of the studio or classroom. As Herman states “Because of the expense that goes into properly preparing an audio lab, student time allotment is truly at a premium. When that practice or lab space includes a large-format analog mix console, time spent in the space is even more valuable. Development of a virtual console model would augment the quality of time students spend in the lab by allowing students a way of practicing and preparing the skills necessary to facilitate productive workflow before they step into the physical lab.” (Herman, 2013).

Another journal paper “Demystifying Mixers”, was submitted to General Music Today, a publication of the National Association for Music Education in 2012. written by Douglas Earl Thompson from Gloria Dei Lutheran Church in Rochester Minnesota, this article is basically a self-contained explanation of the components of most commercial mixers and offers some basic rules of thumb for using a channel strip’s equalizers, setting levels and balancing multiple channels. It is one of the few papers found in this review that specifically mentions channel strips and their various components and overall function. In his conclusions, Thompson reiterates “Modern audio mixers are among the most complex pieces of music technology that music educators encounter and use.” (Thompson, 2012)

Conceptual Design of the Project

The learning theories incorporated into this project are Bloom's Taxonomy, Howard Gardner's multiple intelligences, specifically the Logical-Mathematical intelligence and the Visual-Spatial intelligence and E-Learning Theory as developed by Richard Mayer, Roxana Moreno and John Sweller. This learning guide is partially based on Mayer's definition of multimedia learning which "occurs when people build mental representations from words (such as spoken text or printed text) and pictures (such as illustrations, photos animation or video)." (Mayer, P. 15, 2005). In understanding signal flow through a channel strip, it is important for the learner to be able to visualize the signal moving through the strip's components. This visual-spatial understanding is directly related to the Logical-Mathematical understanding that each knob, fader or button may alter the flow of the audio signal depending on its setting. The interactive visual nature of the project reinforces multimedia learning as set described in E-Learning Theory.

"The process by which people build mental representations from words and pictures is the focus of Mayer's cognitive theory of multimedia learning (Mayer, chapter 3), Sweller's cognitive load theory (Sweller chapter 2), and Schnotz's integrative model of text and picture comprehension (Schnotz, chapter 4). (Meyer P 2, 2005).

Within each channel strip section of this interactive guide, in addition to mouse-conditional hidden/revealed text, there is a photo-realistic representation of each control and potentially, audio/video tutorials for some. As Hill points out, "Appropriate system models must be presented during instruction. These must clearly describe and visualize the operating patterns contained within general concepts. It is not sufficient to simply show students how to accomplish certain procedures on a recording system and assume they see the patterns." (Hill, 2006).

The conceptual design of the tutorial follows the form of the original documentation provided by Audient via their website. The six-page pdf download (Appendix 2) defines and explains the channel strip in sections starting with the “input pod” and continuing down the audio channel through the routing section, equalisers (U.K. spelling) short fader, flip and pan controls and the long fader. For the design of this interactive guide, each of those sections of the channel is a sidebar tab which is a link to the interactive photographic overview of that section of the channel. Additionally, there is an overview tab at the top of the sidebar that tells the user what a channel strip does and instructs them to follow the tabs in order to follow signal flow through the channel. Thumbnails have been added to the initially designed sidebar tabs so users who are returning or are comparing the console to the guide and have a specific function to look at can easily recognize which section they want to interact. The basic design is that of an interactive user guide where users can mouse over each button, knob and fader of the strip and read about its functionality and definition. While most of the buttons, faders and knobs have been given simple HTML and CSS “hotspots” that show text upon mouse-over, the further development plan is to include video tutorial options for some of the more versatile controls. By following the channel strip from top to bottom, any beginning user will be able to understand the audio signal flow through the Audient 4816 channel strip. Additionally, intermediate users will be able to learn how more advanced functions of the channel strip can be used creatively or to set up routine recording and mixing tasks.

Project Sequence and Layout:

As previously mentioned, because the interactive guide has been authored in HTLM 5, it will load and function similarly to a webpage. It has been designed to fit a 15" computer screen, but is scalable to smaller or larger displays.

The opening page (Figure 1) of the interactive guide shows the Audient ASP 4816 console in the main window and shows the numbered tabs on the left sidebar. The only way to return to this page once the user has clicked on a sidebar tab is to simply reload the guide.

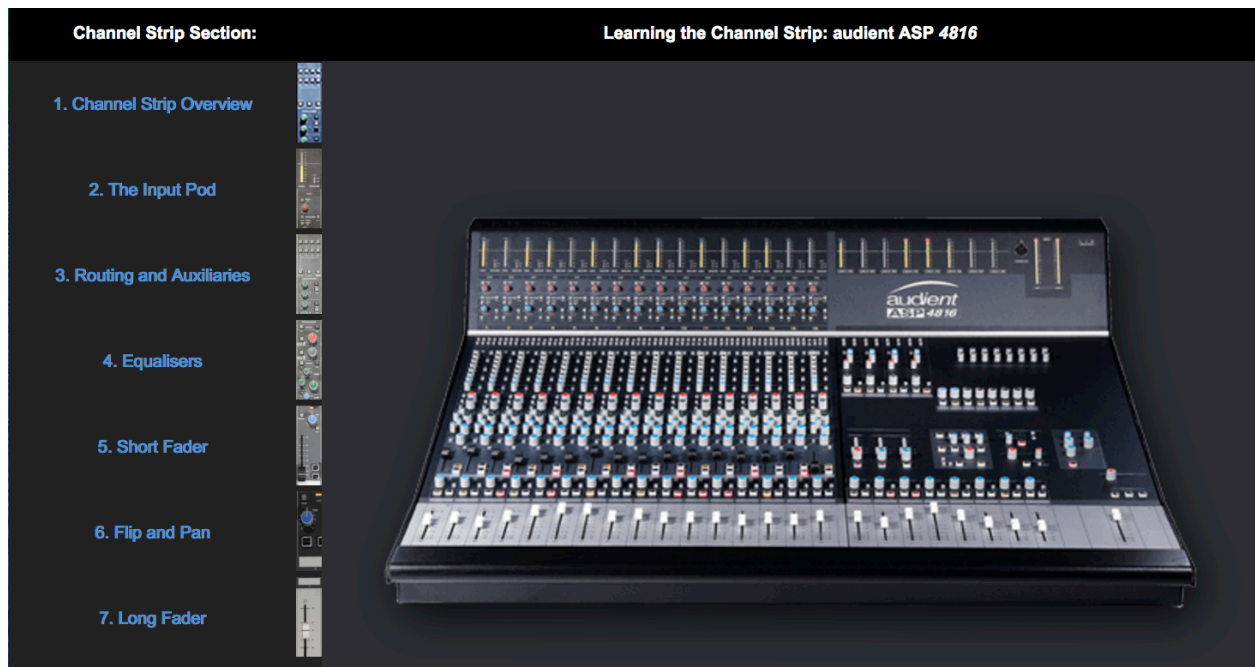


Figure 1. Opening view of Interactive Channel Strip Learning Guide

The user will start with the **Channel Strip Overview** (Figure 2.) and move sequentially through the channel strip's components. The overview tab displays a three-paragraph explanation of what a channel strip is and how it is designed to process audio signals.

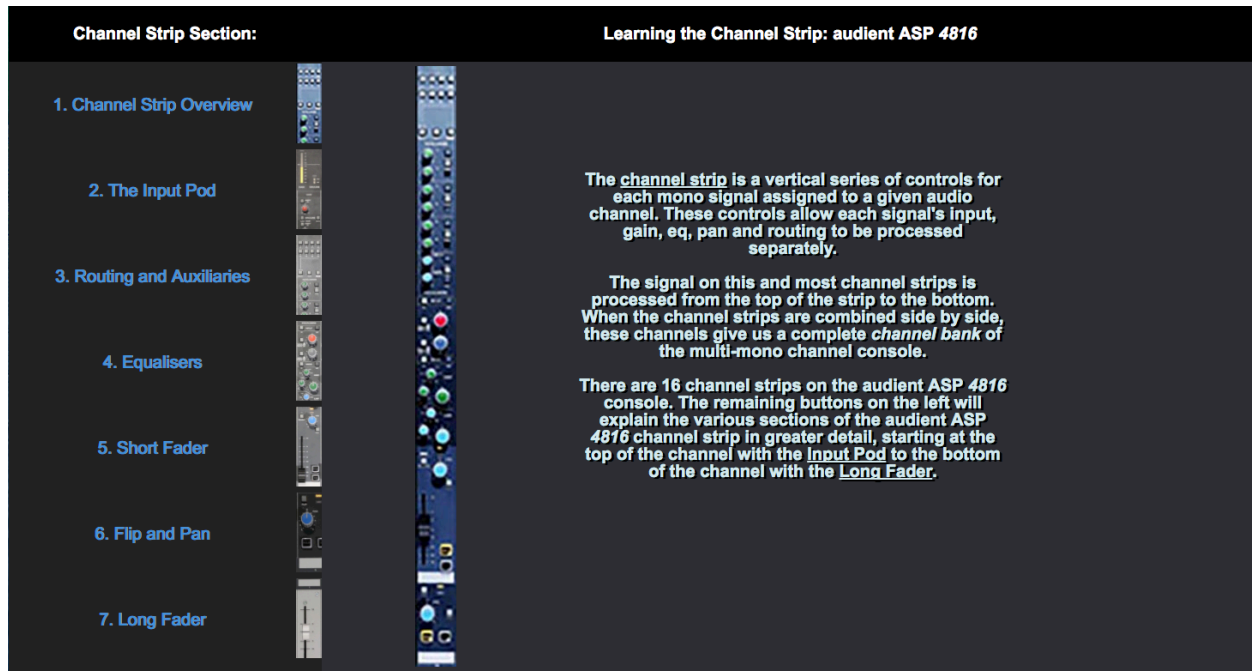


Figure 2. First side tab view of the Interactive Channel Strip Learning Guide showing the Channel Strip Overview.

The first section of the channel strip is the **Input pod**- The Input Pod (Figure 3) is where microphone, instrument and line signals enter the channels strip and initial pre-amplification is applied to a mic level signal. Meters show incoming signal levels for both DAW input and MIC/LINE inputs. The section also contains the controls for applying +48v “phantom” power to condenser microphones and “phase inversion” switch for correcting polarity of a microphone signal.

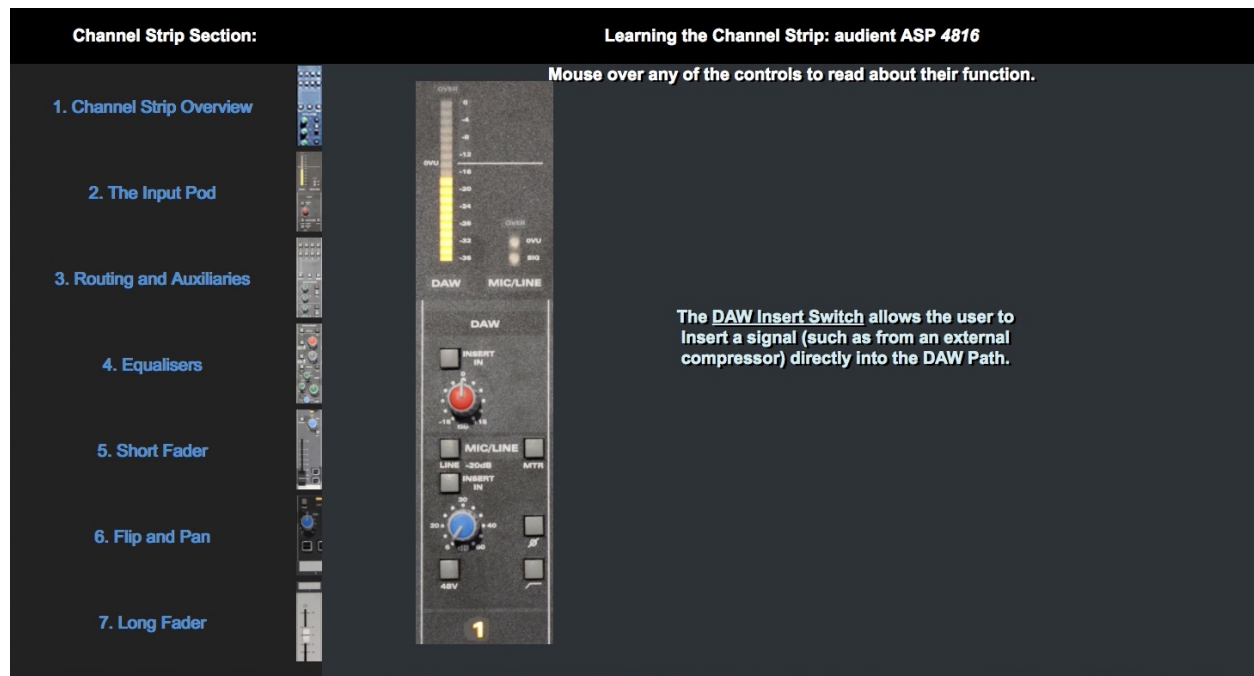


Figure 3. Second side tab view of Interactive Channel Strip Learning Guide showing the Input Pod with the DAW Insert Switch in text reveal mode.

One potential enhancement to this section is a video demonstrating how the channel's DAW Insert Switch (shown above in text reveal state) is best utilized to replace a signal with a totally affected signal, such as an audio compressor. This video will demonstrate how to send a microphone signal from the channel strip into a compressor and then return the affected signal by activating the channel insert button.

Routing and Auxiliaries- The routing switches and auxiliaries (Figure 4) are likewise a way to simultaneously send the audio signal from the channel to an audio effects processor such as an external reverb unit as well as DAW channels for recording.

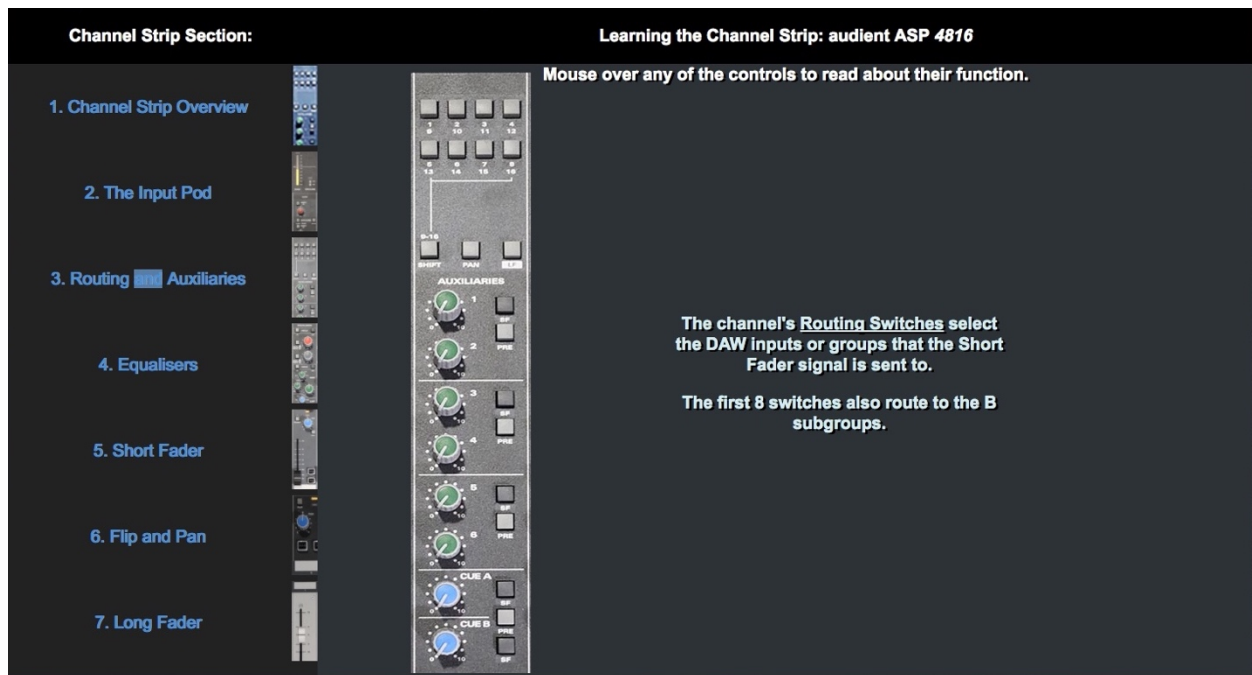


Figure 4. Third tab view of Interactive Channel Strip Learning Guide showing Routing and Auxiliaries with the Routing Switches in text-reveal mode.

One video for this feature would demonstrate how to send the signal from the channel on the auxiliary to a reverb and return the affected (wet) signal to the auxiliary stereo returns in the main section of the console where it can be mixed in parallel with the unaffected (dry) signal from the channel. Another video for this section would show how to set up a studio fold-back or headphone signal mix from multiple channels utilizing the CUE A/B auxiliaries on the channels.

The Equalisers (U.K. spelling)(Figure 5) allow the user to attenuate frequencies in the Low (Bass) range, Middle, and High (Treble) ranges. This console uses High and Low switchable shelving EQs, basically filtering out and adjusting frequencies at certain points. The mid-range EQs are fully parabolic or “sweeping” EQs, allowing pinpoint frequency adjustments in the High-Mid (HMF)and Low-Mid (LMF) ranges.

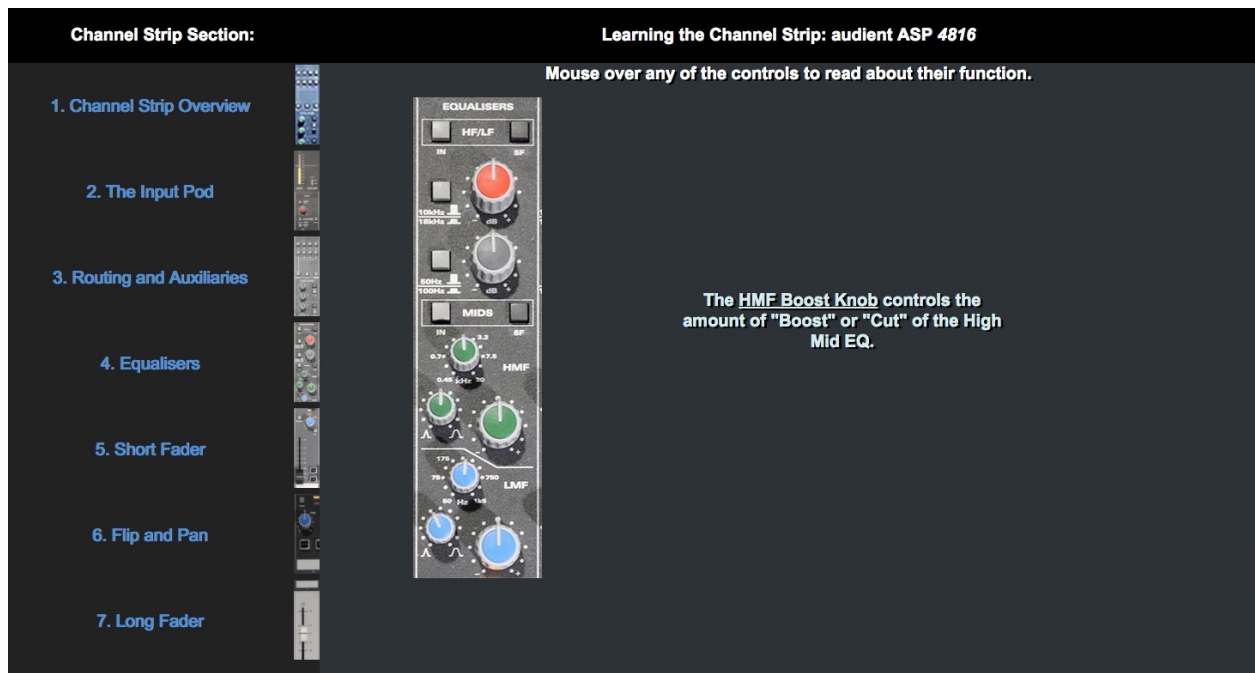


Figure 5. Fourth side tab view of Interactive Channel Strip Learning Guide showing the Equalisers with the HMF Boost Knob in text-reveal mode.

The Console's **Short Fader** (Figure 6) allows the user to select the source (MIC or DAW) of the signal being adjusted, set the level, left/right pan and assign the signal to the master stereo mix along with other channels on the console. In the photo below, the Solo button is in text-reveal explaining the function of the Solo button in both single channel and global modes.

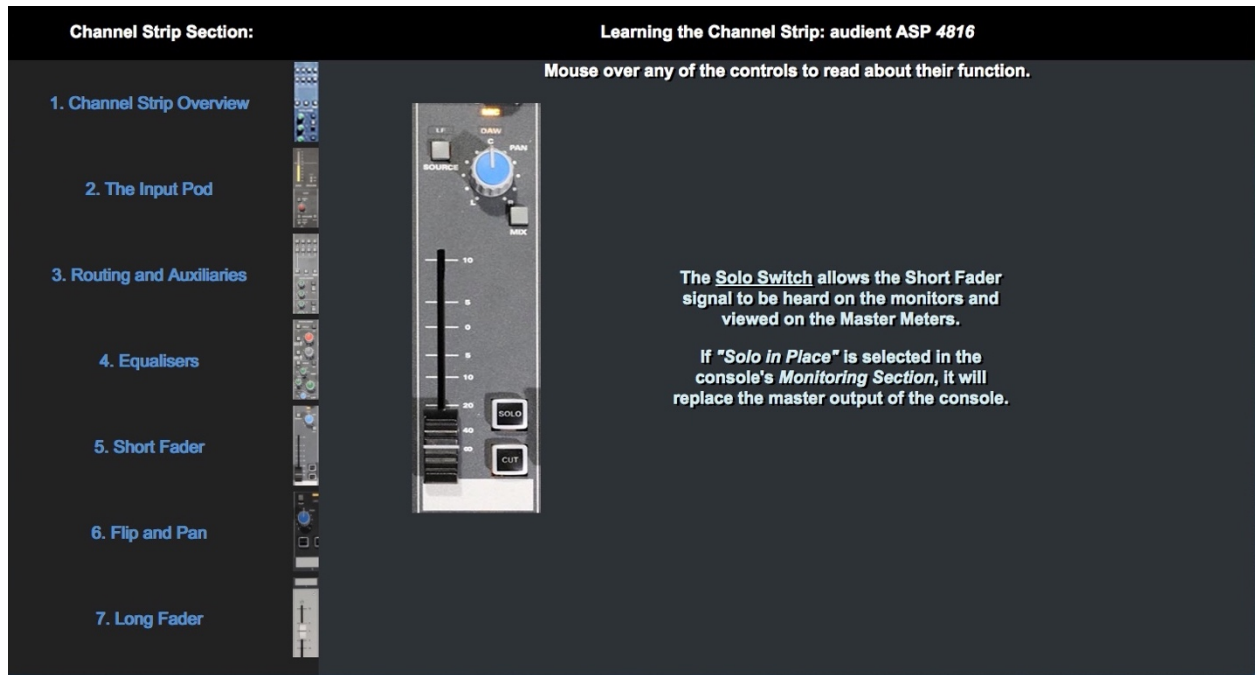


Figure 6. Fifth side tab view of Interactive Channel Strip Learning Guide showing the Short Fader with the Solo Switch in text-reveal mode.

Flip and Pan (Figure 7) functions allow the user to assign signal and functionality between the two faders found on the Audient ASP 4816 channel strips. The Flip Switch basically reverses functions between the two faders. The Mix, Pan, Solo and Cut controls shown in this section otherwise are associated with the Long Fader.

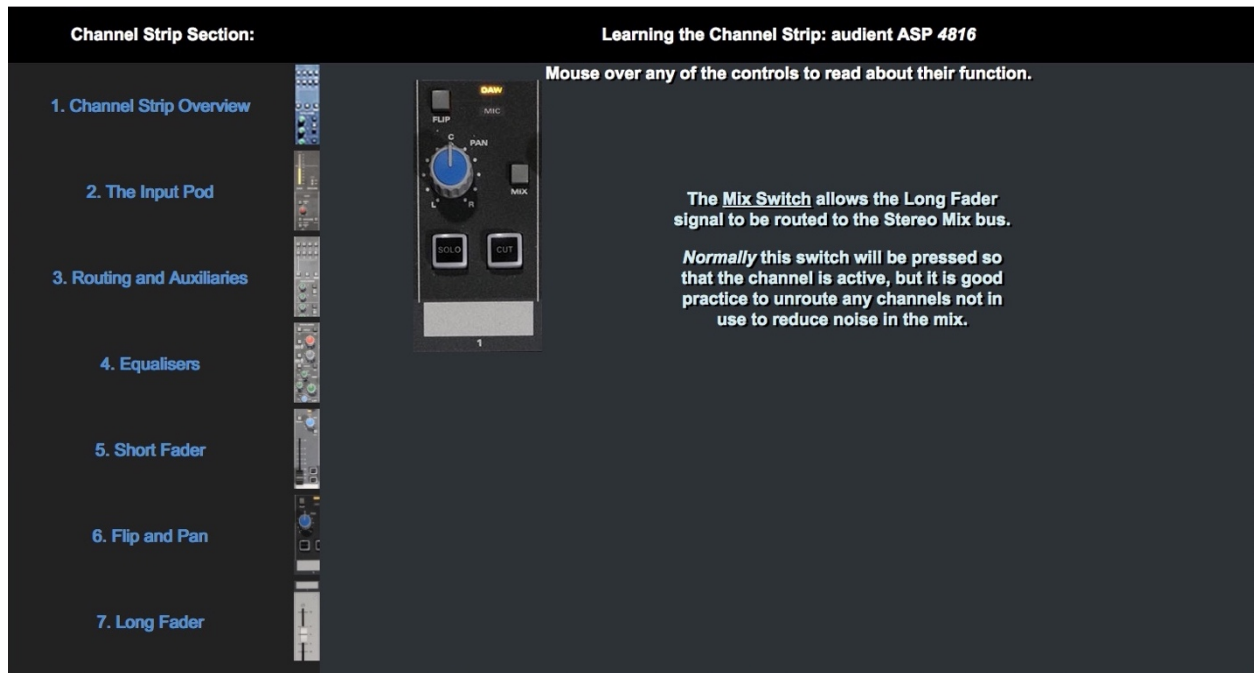


Figure 7. Sixth side tab view of Interactive Channel Strip Learning Guide displaying the Flip and Pan section with the Mix Switch shown in text-reveal mode.

The **Long Fader** as defined within the Audient documentation has limited functions, basically controlling the level of signal sent to the stereo mix. For this reason, the markings on the fader are the most significant feature. To demonstrate this, the Long Fader has been designed as a working HTML5 range slider. When the slider reaches a value that corresponds to the crucial markings, the text will display what that marking is and why it is significant. In the photo below, the slider is at 67%, corresponding to the 0dB marking on the Long Fader, thus the 0dB explanation is in text-reveal mode.

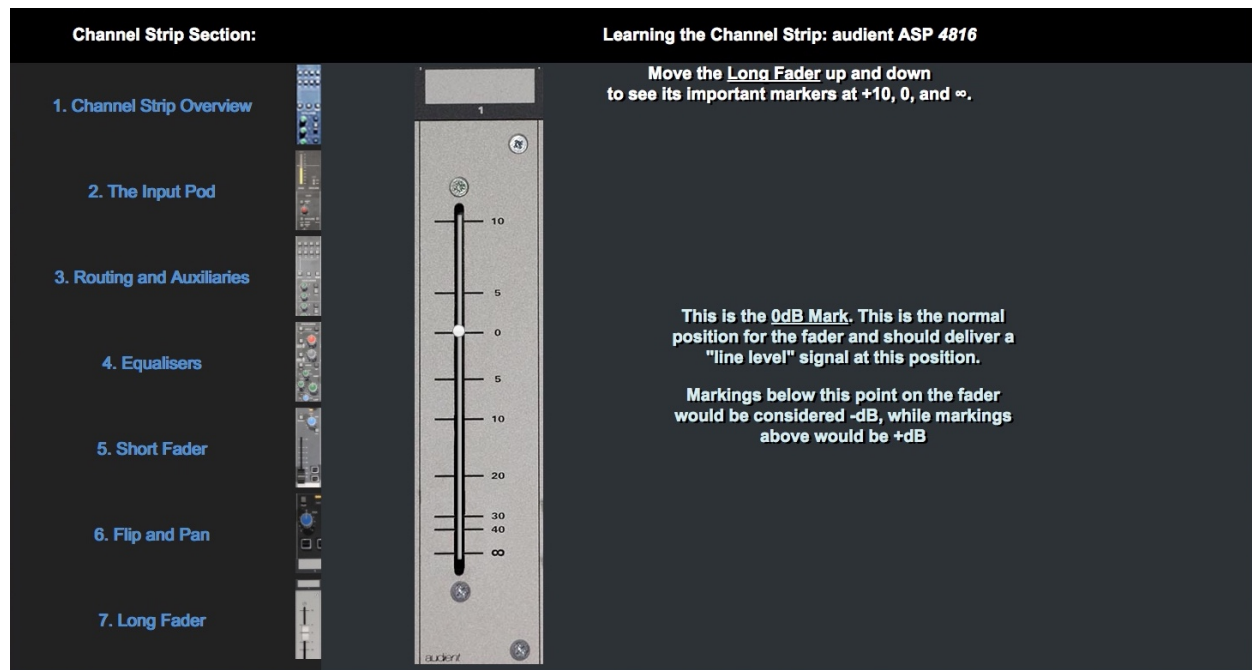


Figure 8. Seventh side tab view of Interactive Channel Strip Learning Guide displaying the Long Fader with the 0dB mark shown in text-reveal mode activated by the vertical slider.

By giving the user the opportunity to interact with each section of the channel strip, the learner can explore the various buttons and knobs at their leisure. They can return to a section or specific switch time and again in order to reinforce their understanding of that control's function. Ultimately, by exploring the strip through the tutorial in order, the student should have a working understanding of the channel strip and how a signal flows through it. The guide is designed to give students a stand-alone reference that offers more interactive, useful and in-depth information than a printed user's manual, if by no other means than providing the same information in a way that students are more likely to interact with. The interactive nature of this module is designed to encourage visual learners and users of this music technology with an interface that they will find welcoming and more rewarding than

reading through a technical manual. Thumbnail photos on the side tabs allow return users to quickly access the specific control that they need to get information about.

It should be noted that this module could also be fully developed as a working audio signal model using the robust programming found in Cycling '74's MAX and MSP. The MAX model could be developed as a more generic, less brand-specific model or as brand-specific as possible with electronic specifications and schematics from the manufacturers. It would be possible given the capabilities of MAX to have three separate inputs using a computer's mic along with oscillators and other sources. These types of working virtual components are commonly used in higher education. Berklee School of Music for example has virtual models of expensive analog synthesizers that students can use to learn, practice and display their proficiency prior to working with the physical instrument.

Project Content

The tutorial is intended to be utilized both during class lecture and as an adjunct to classroom instruction and as an attractive way for students to interact with the manufacturer's explanation of the controls of the Audient ASP 4816 channel strip and to correct the discrepancies between the documentation that was written for the ASP 8024 that was also supplied as the documentation for the ASP 4816. The fact that this learning guide can be accessed outside of class when working alone with the console or reviewing its functionality when studying in their dorm or elsewhere allows each student to utilize it at their own pace and need. Once a student has a working understanding of one channel, they have essentially learned the function of all sixteen channels on the console and an insight into the other auxiliaries and faders on the console. This self-paced guide allows the user to go through each

section of a channel strip from input to output and read about each of the controls and its function within the strip. The video tutorials would be designed to explain why a certain control (such as the channel insert) works the way it does and demonstrate how it may commonly be used.

The interactive nature of the learning guide allows students to work at their own pace, create a mental model to follow the flow of an audio signal through the channel strip and revisit the tutorial as a quick reference wherever they have access to the tutorial online. This type of tutorial should have a higher rate of usage than simply handing students documentation and asking them to read through it. The interactive visual and text design, according to e-learning theory should also mean higher retention and greater comprehension of the material as well.

The project limitations are those of time and programming knowledge. While this could be fully developed into a full working model of either a generic channel strip or that of an Audient ASP 4816 using resources such as the Audient console documentation, and Cycling 74's MAX combined with the existing HTML5, CSS and JavaScript, the time needed to develop it as such exceeds the project's timeframe. The entire project will be completed by August, 2017.

Another limitation lies within the pilot survey. The survey was limited to ten questions on SurveyMonkey.com before reaching the paid subscription limit. As such, the questions were designed in three stages. The first stage was to collect data on the respondent's role in audio production education, the type of program that they were associated with and what platforms they used to distribute supplemental materials and what type of console(s) they used in that

program. The second stage was to have the respondents review and compare the original manufacturer's documentation and this project in its current form. The final phase was to gain feedback on what enhancements, such as video elements and a virtual version designed in MAX or any other suggestions the respondent wanted to make. As a pilot study, the author felt that this was an adequate preliminary gathering of information, but subsequent surveys or even research panels could be used to get more specific data and greater quantities of related data.

Project Tools and Resources:

The order of the content logically follows the documentation for the channel strip provided by Audient via their website and user's manual. The signal from most channel strips, Audient included, starts at the top of the channel with the microphone preamp and continues downward through the routing, equalizers and faders. The tutorial follows each of these sections in the order and divisions that Audient has defined in their documentation.

In following the manufacturer's definition of sections as well as their naming schemes, British spellings and photographs of an actual console, there is little danger of a student finding contradictory information on the manufacturer's website or in other documentation.

The resources needed to develop this tutorial as it is currently designed are a code editor (Sublime) and a color picker program (Sip) which allowed for colors to be matched to those on the console. A high quality DSLR capable of taking high resolution stills was used to photograph the console and would also be used for recording audio and video for video tutorials. Adobe Photoshop was utilized for cropping and editing the photos and exporting them as .jpg files for use in the interactive guide. Adobe Premiere would be utilized for editing the video files that would be used to replace previously identified hidden text for specific controls. Apple iOS

includes a command that allows for both screen capture and pixel measurement (command+shift+4). This was used to measure the pixel size and placement of each control button, knob and fader within each of the photographs in order to set the “hotspots” for interactivity in CSS.

Lastly, the original documentation from Audient’s website, www.audient.com was required in order to create the interactive version as close to the source material. This documentation has recently been updated on the Audient website, possibly in response to inquiries for additional documentation for this project as it was brought to their attention that the channel strip documentation for the ASP4816 was actually the documentation for the older and larger ASP8024 console.

The tutorial has been posted online for a pilot study of educators and potential users. The tutorial consists of a master folder containing the HTML5 file (which also contains the necessary CSS and JavaScript to give the guide its style and functionality) as well as a media folder containing the media (photos and any added video) for the tutorial to access in order to fully function. I have been consulting with Dr. Scott Deal as my advisor on this project for his guidance in making additional revisions.

Pilot Survey

The pilot survey was created on Survey Monkey on July 10, 2017 consisting of ten questions (Appendix 4). As mentioned previously, the questions were asked in three stages. The first stage was somewhat demographic, asking the respondent about themselves and their programs. The questions asked the respondents to self-identify their classification as faculty, student, etc. They were asked how supplemental materials were distributed, how they would

best identify their degree or program and what makes of audio consoles they utilized in their programs.

The second stage asked them to review and rate the original written materials and the interactive guide. They were then asked to preview the materials in Appendix 1, the Audient channel strip guide in pdf form and to rate it on a five-point scale as to how likely they would be to use it as supplemental material in teaching signal flow of the channel strip and to explain why they answered that way on the scale. They were then asked to go to a web server hosting the interactive guide and click through it and evaluate their likelihood of using it on the same scale as the pdf and again to explain why they chose that rating.

The final stage of questions allowed the respondents to give feedback on the interactive guide and any enhancements that they saw as being valuable additions. The respondents were given four optional enhancements to the guide and asked which ones they would like to see added or designed. Lastly, they were asked for additional feedback and any additional equipment that they would like to see in additional guides.

During the week of July 10, 2017, the online survey was posted to a Facebook group for fellow IUPUI MSMT students, emailed to over 200 active members of MEIEA (Music & Entertainment Industry Educators Association) in their July email bulletin (appendix 3) and randomly emailed by a colleague to 25 current and former students of his choosing at Butler University (who have trained on the Audient 4816 or Audient 8024). Additionally, the survey was emailed to 20 professional engineers ranging from local studio engineers to network live television audio engineers, audio supervisors at NPR and a sound design engineer at a major film production company in Hollywood, CA. This made over 250 potential respondents that were asked to

compare the interactive guide to the printed documentation and review which they feel would be more useful to them both in the classroom as well as independent learning and as a stand-alone reference. The anticipation was to elicit the opinions of a minimum of 30 respondents to the survey across a variety of educators, students and those who have at some point in their careers learned the signal flow of an audio console either by rote or in an academic setting.

Project Evaluation:

The data was collected and tabulated in order to determine the value of the tutorial and its effectiveness as a classroom teaching aid as well as a stand-alone interactive guide and reference. By surveying both faculty who may use the guide and students who have trained without it, the pilot study gathered data from a wide variety, including these two significant groups of users.

The survey was open online for sixteen days. The original plan was to limit it for two weeks and then do analysis, but the author decided to try to collect more responses. A total of 27 people responded. The majority were either full-time or part-time faculty (40.74%) Next were both professional audio engineers and “others” at 18.52% each. Undergraduate students made up 11.11% of the responses, graduate students 7.4% and support or administrative staff 3.7%. Those answering other included RIS Graduate, Professional Concert Producer, Talent Agency Staff, Music Store Owner and audio video background.

When asked which best described their department, program or degree, 37.04% identified as Recording Industry Studies, “other” responses comprised 18.52%, Audio, Video or Multimedia Production registered at 14.81%, both Music Business and Music Technology made up 11.11%

each and Music represented 7.41%. “Other” responses included “Music Entrepreneurship”, “No longer in school” “sound for theatre” “Psycho-Musicology” and “Mass Communication”.

Next, the respondents were asked which systems were used to distribute supplemental material, those polled could select multiple answers. The majority responded “Dropbox, Box or Google Drive” with 51.85%. “Moodle” ranked second with 40.74%, followed by “other” 18.52%, “Department or University hosted website” 14.81%. Both “Website hosted independently from the institution” and “Canvas” ranked lowest with 11.11% each. Four out of five responding “other” responded “Blackboard” while the fifth responded “hand out in class”.

Question four asked the respondent which brands of audio consoles (listed alphabetically) their institutions currently owned and use for teaching audio production. The majority response was “Audient” at 46.15%. Second was “Avid” at 39.46% followed by “Other” at 30.77%. The “other” responses included Yamaha (5) Midas (1), Behringer (1), Lawo (1), Apogee (1), Universal Audio (1) Ableton (1) and Propellerhead (1).

In the next section, respondents were asked to download and review one or more pages of the Audient channel strip documentation that was originally supplied by the manufacturer via their website and rate how likely they were to utilize this as a supplement when teaching the channel strip of the Audient ASP 4816. The scale ranged from 1 (Highly Unlikely) to 5 (Extremely Likely). The majority of the respondents said 3- Likely at 33.33%. Next was 2-Somewhat Likely at 25.93%, followed by both 4-Very Likely and 1-Highly Unlikely each at 14.81%. Last was 5-Extremely Likely at 11.11%.

When asked to explain their answers, responses ranged from “We just use the gear” to “Depends on the skill level of the class” to “I think it would give the students a ready reference

that they could refer to when engaged in initial projects. Also the visual aspect helps solidify the workings of the console in their minds even when not in the studio.” Some respondents chose 1-Highly Unlikely because they do not own or teach with an Audient consoles. One respondent chose 5-Extremely Likely and said “Some type of manual/written instruction is crucial to a hands-on learning process. Students must be able to go back and read interpret diagrams at their own pace, whereas hand-on (sic) instruction is much more tactile and can happen very quickly.”

Question 7 directed the respondents to go to the interactive learning guide and click through the application, then rate it on the same 1-5 scale as a supplement to classroom and hands-on learning the Audient ASP 4816 console. The responses moved up on the scale in most cases with the majority 37.04% choosing 4-Very Likely followed by 5-Extremely Likely at 22.22%, and 3-Likely at 18.52%. Adding these same numbers for responses 3-5 in the previous question yielded 59.25% of respondents that would consider it likely or higher that they would use the pdf documents. In the case of the interactive guide, the percentage jumped to 77.78% who would consider it likely or higher to use the HTML based option, a difference of 18.53%.

When asked to explain their ranking, those replying 3 or higher offered the following responses:

“feels more realistic”, “more intuitive than print”, “it gives the student the ability to get the information in the sequence they need it” “If I were teaching this console, I would definitely utilize something like this if it were available.” and “...This was easy to navigate and gave me information quickly”. These positive responses and 18.53% higher ratings between the user manual pages and the interactive learning guide demonstrate the viability of this type of learning guide as both supplemental learning material and a stand-alone tutorial.

The eighth question asked the respondent to choose any or all of four proposed additions that they would find helpful in demonstrating the channel strip's functionality. 84% wanted to add a video demonstration using the auxiliary sends to a reverb and returning the signal to the console for mixing wet and dry signals. 80% wanted to add the video demonstration showing the DAW Insert switch to send a signal to and from a compressor. 68% chose a video demonstration showing the use of Cue A and B to set up headphone mixes for studio foldback. Only 44% chose a separate virtual working model of a channel strip using MAX in addition to HTML. "Other" responses made up 12% and included "hardware", "demonstration of the Flip function" and "align the graphics of each console section".

The final question just asked for additional feedback, other features or equipment that the respondents would like to see developed. These nine responses ranged from simply "you're welcome" to one request for a similar application for the Allen & Heath Qu-32 to the following two responses:

"I always believe that hands-on experience with the equipment leads to better understanding. Videos could be extremely helpful in this regard when learning in a virtual setting."

"I wouldn't say no to any additional resources for teaching, applying as many different learning style accommodations as possible. Videos and explicit demonstrations are very useful for some students. Interactive simulations are great for others. Some will dig into detailed written materials, others learn by doing. Students benefit when they are able to learn material in a way that makes sense to them."

Summary:

This survey demonstrates that different institutions, utilizing different equipment in different programs will likely need to tailor their learning materials to their students as they determine to be best. It also, however demonstrates that since no single text can include every audio console or piece of equipment, that there is a need for materials such as this HTML based learning

guide. HTML combined with JavaScript and CSS as well as MAX offer powerful software-based options that can stand alone on a desktop or be run from any web or network-based server. The versatility of such program authored applications allows the designer to adapt the function of the application to fit the need at hand provided there is time to design such an application. These types of applications could be offered by textbook publishers as supplemental modules, manufacturers in place of or in addition to their written documentation or created by a professor or graduate student to be used in technical learning of audio equipment. While 18.53% is not an overwhelming percentage of those that preferred the interactive guide to print, it is an increase that supports the fundamentals of e-learning used in the design of this type of application. As with any application, there is room for improvement, feedback can be incorporated into the existing design and functionality can be added to the point of a fully working model given the resources to do so, the most significant being time.

Project Timeline:

The majority of the project was designed and developed in MUS N516 Advanced Interactive Application Development in the spring semester of 2017. The project was further developed by restoring functionality to the vertical slider that acts as the Long Fader in the last side bar tab of the guide. In addition, at the advice of Professor Meng, thumbnails were added to the side bar tabs in order to allow a visual point of reference for return users who might be looking for information about a specific control within a given section. The pilot study was administered between July 11, 2017 and July 26, 2017. The data collection window via online surveys was part of the final phase and acted a pilot study. The survey was

estimated to take between ten and fifteen minutes to complete, depending on how many of the user manual pages were downloaded and read by the respondent. Once the survey was closed, the data was downloaded from Survey Monkey and analyzed. The analyzed results are discussed in the previous section.

Acknowledgements:

The author would like to acknowledge the guidance and assistance of Dr. Debra Burns, Dr. Scott Deal, and Professor Chuiyuan Meng of IUPUI's Music Technology Program in the development and completion of this project. Additionally, I would like to recognize the support of Dr. Gary Edgerton, Dr. Kenneth Creech, Professor Christine Taylor, Dr. Paul Linden, Professor Cutler Armstrong and Professor Carrie Ritchie, my colleagues and mentors at Butler University for their overwhelming support of my pursuit of this degree. Lastly, I dedicate this project to the love and support of my parents, Jerry and Sharon Harris, my sister Ann Bredensteiner and her husband Kurt and my wife Kim.

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Appendices:

Appendix 1: Screen shot of Sage Publications Video Listing for Television, Radio and Audio

Appendix 2: Original Audient Channel Strip Documentation for ASP 8024/4816 (6 pages)

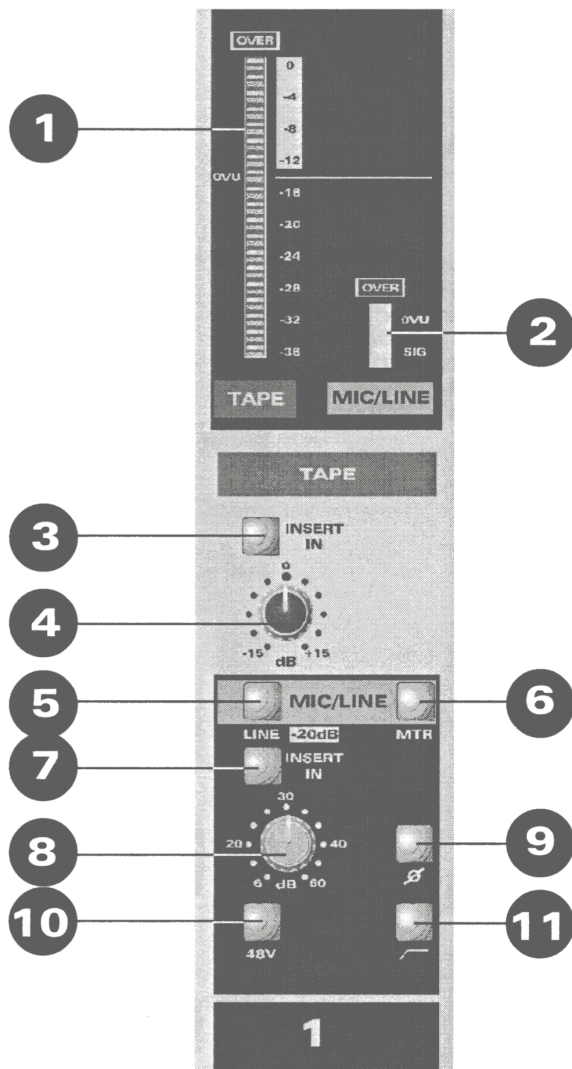
Appendix 3: Revised Audient Channel Strip Documentation for ASP 4816 specifically (6 pages)

Appendix 4: Survey Monkey Pilot Survey results

Television, Radio & Audio					
Nina Huntemann Discusses Video Games	Interview	SAGE	2015	Exclusive	00:42:48
TV News Editing	Practice	SAGE	2015	Exclusive	00:13:08
Executive Producer	Practice	SAGE	2015	Exclusive	00:06:47
TV Formats - Global Sales and Production	Practice	SAGE	2015	Exclusive	00:17:25
Television Fixer	Practice	SAGE	2015	Exclusive	00:12:08
Location Scout	Practice	SAGE	2015	Exclusive	00:09:35



Title	Video Type	Publisher	Publication Year	Exclusivity to SAGE	Length (hh:mm:ss)
Television and Video Producer	Practice	SAGE	2015	Exclusive	00:12:35
BBC Radio Editor	Practice	SAGE	2015	Exclusive	00:09:32
Practical Sound Recording	Practice	SAGE	2015	Exclusive	00:09:25
Jim Sayers - Independent TV Production	Interview	SAGE	2015	Exclusive	00:51:19
Patrick Uden - Factual Scriptwriting and Storytelling	Interview	SAGE	2015	Exclusive	00:45:17
Claire Lillis and Isabel Cook - Negotiating Access for TV	Interview	SAGE	2015	Exclusive	00:35:36
Alan Barker - Sound for Filmmaking	Interview	SAGE	2015	Exclusive	00:30:56
Clockwork Radio	Documentary	BBC	1995	Non-Exclusive	00:30:00
A Newsday Revolution	Documentary	BBC	1988	Non-Exclusive	00:50:00
Panorama: Life on TV	Documentary	BBC	2000	Non-Exclusive	00:40:00
Understanding Music Radio's Present from Music Radio's Past	Tutorial	SAGE	2015	Exclusive	00:10:00
How Radio Broadcasters Are Responding to the Opportunities of the Digital Age	Tutorial	SAGE	2015	Exclusive	00:10:00
[T] TV Studies (A to Z)	Tutorial	SAGE	2015	Exclusive	00:10:00
Video Games					



- 1 20 Segment meter
- 2 3 Segment meter
- 3 **INSERT IN** places an insert point in the TAPE path
- 4 Tape Input **TRIM** control
- 5 **MIC/LINE** switch - press down to select the line input.
- 6 **MTR** - press to show the mic/line input on the large meter and the tape input on the small meter.
- 7 **INSERT IN** - places an insert point in the MIC/LINE path.
- 8 Mic/Line **GAIN** Control
- 9 **Ø** Polarity (Phase) Reverse Switch
- 10 **48V** Phantom Power Switch. Turn the loudspeakers down before switching this on or off!
- 11 **High Pass Filter** Switch. A high pass filter can be used to get rid of any unwanted low frequencies that may be present such as air conditioning rumble.

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INPUT POD

The input pod is the gateway to the remainder of the signal processing of the console. There are three inputs, a mutually exclusive microphone and line input, and a tape input.

Note the different colouring used to identify the different signal paths of the pod. Anything on a light background is associated with the LF path while anything on a dark background is associated with the SF path.

The mic/line input normally sends signal to the SF or short fader signal path of the console while the tape input normally sends signal through the LF or long fader path of the console unless this is reversed by the FLIP switch.

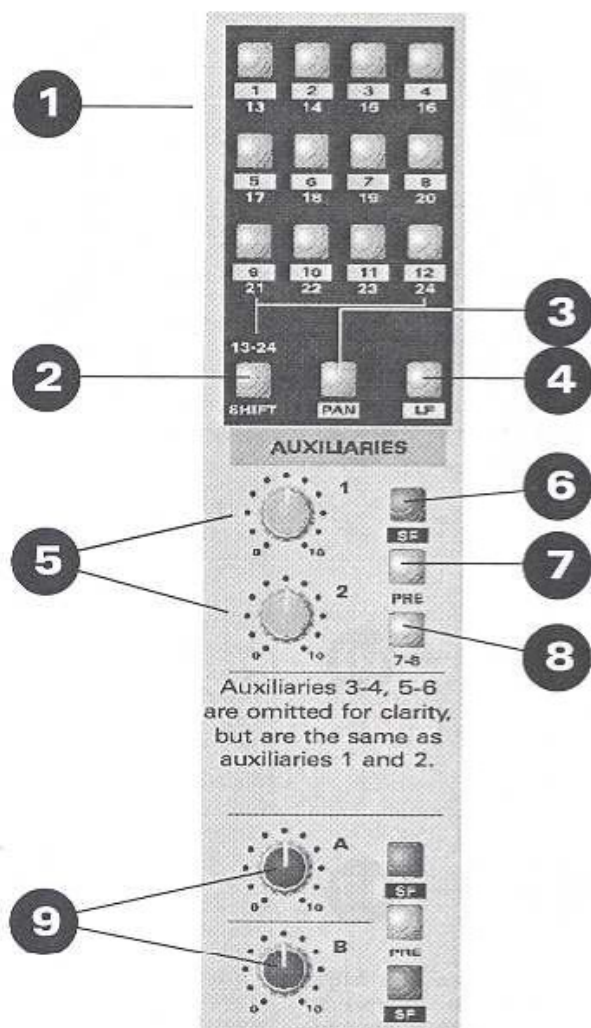
There are two meters associated with the inputs, a 20 segment 0dBFS peak reading meter showing the tape input signal and a 3 segment peak reading meter gives an indication of the mic/line level.

Both the MIC/LINE and the TAPE inputs have insert points which can be switched in and out of circuit.

The Mic Input has a gain control range of +6dB to +60dB and the Line Input has a range of -14dB to +20dB. Switches allow for Phantom Power, Polarity Reversal and High Pass filtering.

The TAPE input has a trim control with a range of ± 15 dB.

There is a back illuminated number at the bottom of the pod for channel identification.



- 1 **ROUTING SWITCHES** select the group outputs that the SF signal is sent to. The first eight switches also route to the 8 subgroups
- 2 **SHIFT** gives access to group outputs 13 - 24.
- 3 **PAN** allows the signal to be panned across odd and even groups.
- 4 **LF** replaces the SF signal being sent to the routing switches with the signal from the LF signal path.
- 5 **LEVEL** adjusts the level sent to an auxiliary output.
- 6 **SF** allows the signal feeding the auxiliary to be taken from the SF signal path.
- 7 **PRE** allows the auxiliary signal to be taken pre fader instead of the normal situation where it is taken post fader.
- 8 **7-8** allows the signal to be routed to auxiliaries 7-8 instead of 1-2.
- 9 **AUXILIARIES A and B** are identical in operation to the others but can be individually switched into the SF path.

ROUTING and AUXILIARIES

The routing section takes the signal from the SF path and routes it to the group outputs which in turn are usually connected to the inputs of a multi-track recorder. Groups 1 to 8 also have a parallel path and feed the 8 sub groups. These can be used to pre mix channels together for final mix down or as sends to an 8 track recorder.

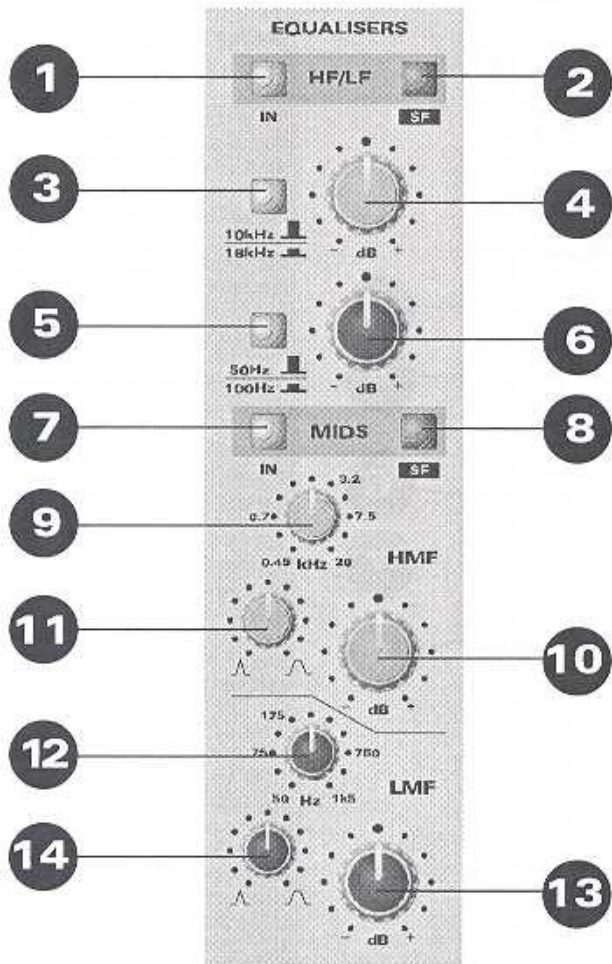
There are 24 group outputs accessed by 12 routing buttons and a SHIFT button.

Routing can be to multiple outputs and if odd and even outputs are selected panning can be used to place the signal within a stereo image.

The LF switch moves the routing from the SF path over to the LF path and can be useful for track bouncing. If PAN is down and routing is again selected for odd and even groups then the post fade post pan LF signal is sent to the group outputs selected.

There are 14 auxiliary outputs although the number of panel controls does not reflect this. Again a switch is used to assign the controls between two pairs of auxiliaries. Auxiliaries 1 and 2 can be switched for use as 7 and 8 for example. The Auxiliaries can be switched to the SF path.

Auxiliaries A and B work in the same manner as the other auxiliaries but are intended mainly for use as sends to the FOLDBACK system.



- 1 **HF/LF** Section. This places the HF/LF equaliser in circuit.
- 2 **SF** places the HF/LF equaliser in the SF signal path where it can be used to treat a signal before it is recorded.
- 3 **10kHz/18kHz** allows the frequency of the HF equaliser to be selected.
- 4 **HF boost/cut** control.
- 5 **50Hz/100Hz** allows the frequency of the LF equaliser to be selected.
- 6 **LF boost/cut** control.
- 7 **MIDS** Section. This places the MIDS equaliser in circuit.
- 8 **SF** places the MIDS equaliser in the SF signal path where it can be used to treat a signal before being recorded.
- 9 This controls the centre **FREQUENCY** of the high mid equaliser.
- 10 **HIGH MID boost/cut** control.
- 11 **HIGH MID Q** control.
- 12 This controls the centre **FREQUENCY** of the low mid equaliser.
- 13 **LOW MID boost/cut** control.
- 14 **LOW MID Q** control.

EQUALISER

Note the light background indicating that the equaliser is normally associated with the LF signal path.

The equaliser is split into two sections - one for high and low frequencies (HF/LF) and the other for middle frequencies (MIDS). Both sections can be switched in and out independently and switched into the SF signal path independently.

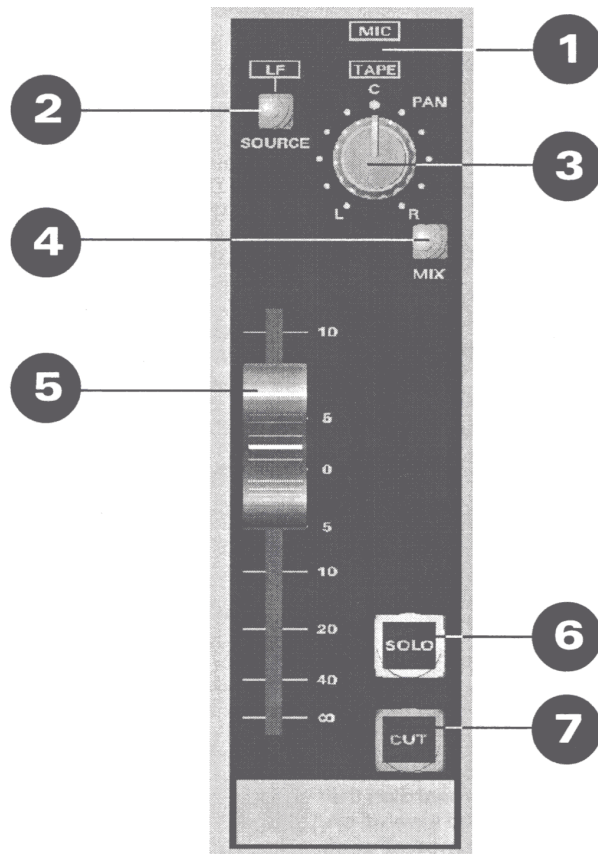
The HF section has a boost/cut range of 15dB. The frequency can be switched - 10kHz with the switch up and 18kHz with the switch depressed.

The LF section has a boost/cut range of 15dB and a shelving characteristic. The frequency can be switched - 50Hz with the switch up and 100Hz with the switch depressed.

The high mid section (HMF) has three controls. The boost/cut range is 15dB and the frequency of operation can be varied from 450Hz to 20kHz. A Q control allows for a very sharp and narrow characteristic or for a more gentle characteristic covering a wider range of frequencies.

The low mid section (LMF) has three controls. The boost/cut range is 15dB and a shelving characteristic. The frequency of operation can be varied from 50Hz to 1.5kHz. A Q control allows for a very sharp and narrow characteristic or for a more gentle characteristic covering a wider range of frequencies.

The actual Q range is between 3.8 (0.4 Octave) and 0.65 (2 Octaves).



- 1 MIC/TAPE. These back lit indicators show whether the MIC/LINE or the TAPE input is selected to the SF path. Only one will be illuminated and it can be changed by using the FLIP switch.
- 2 SOURCE selects the post fade LF signal as the input to the SF signal path, over-riding the MIC or TAPE selection from the Flip switch. By altering a link on the circuit board this signal can be made pre fade. The LF legend will illuminate when the switch is pressed and the MIC/TAPE indicator will blank.
- 3 This is the PAN control for the SF signal enabling it to be panned across odd and even groups.
- 4 MIX routes the SF signal to the stereo mix bus. It is good practice to unroute any channels which are not needed. This will reduce mix amp noise.
- 5 This is the SHORT FADER which controls the level of the SF signal.
- 6 SOLO allows the SF signal to be heard on the monitors and viewed on the master meters. If Solo In Place is selected it will replace the console output.
- 7 CUT allows the SF signal path to be muted. This may help to reduce noise in a mix if a channel is not in use for a period of time.

SHORT FADER (SF)

There are 3 back illuminated indicators showing the selected input to the SF path. This can be changed between Mic/Line and Tape using the FLIP switch.

LF Source allows the source for the SF path to be taken from the LF path. This could be used during mixdown to send the LF signal through the SF path up to the routing matrix where the group outputs can be used as additional effect sends. Normally this signal is derived after the long fader (POST LF) but it can be made PRE LF by changing an internal link on the circuit board.

The source switching occurs before the equaliser so it is possible to equalise the SF signal which has been taken from the LF path by switching either one or both equaliser sections into the SF path. (If this is done then the equaliser section is no longer available in the LF path).

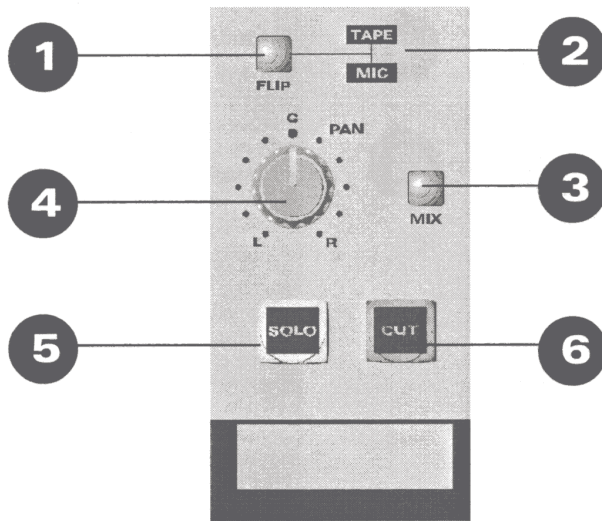
The SF PAN control allows panning across the group outputs when pan is selected on the routing section of the strip.

MIX allows the SF signal to be routed to the stereo mix bus and allows the SF path to be used as an additional input during mixdown.

The short fader is designed for use with 10dB of gain in hand allowing the signal to be boosted or reduced in level if required.

The SOLO switch allows the channel to be auditioned through the AFL/PFL or Solo in Place facilities.

CUT allows the SF signal path to be muted.



- 1 FLIP swaps the inputs between the LF and SF paths.
- 2 These back lit indicators show whether the MIC/ LINE or the TAPE input is selected to the LF path. Only one will be illuminated and it can be changed by using the FLIP switch.
- 3 MIX allows the LF signal to be routed to the stereo mix bus. Normally this switch should be pressed but it is good practice to unroute any channels which are not needed. this will help to reduce mix amp noise.
- 4 This is the PAN control for the LF signal enabling it to be panned across the stereo bus
- 5 SOLO allows the LF signal to be heard on the monitors and viewed on the master meters or, if Solo in Place is selected, it will replace the console output.
- 6 CUT allows the LF signal path to be muted. This may help to reduce the noise in a mix when a channel is not in use for a period of time.

FLIP and PAN

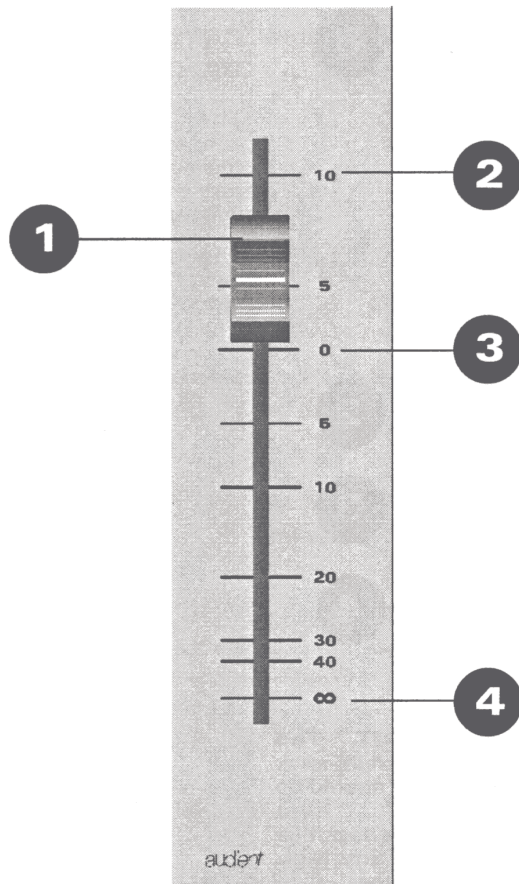
The FLIP switch allows the MIC/LINE input and the TAPE input to be reversed. Normally the TAPE input feeds the LF signal path - with FLIP pressed it will feed the SF signal path. The MIC/LINE input normally feeds the SF signal path and with FLIP pressed it will feed the LF signal path. Illuminated indicators in each section show which input is selected to the LF and SF paths.

The PAN control pans the LF signal across the stereo mix bus and the MIX switch assigns the LF signal to the stereo bus.

The SOLO switch allows the long fader signal to be auditioned through the AFL/ PFL or Solo in Place facilities.

CUT allows the LF signal path to be muted.

Page 33 gives more detail regarding the long fader used to control the level of the LF signal path.

**LONG FADER (LF)**

Located close to the operator this fader operates on the LF signal path and is therefore mainly used for creating the monitor mix and the final stereo mix for the title.

The fader is expected to operate around the 0dB mark with 10dB of gain in hand allowing the signal to be increased or decreased in level.

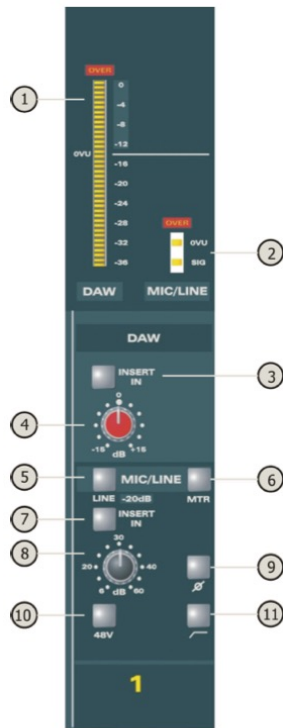
When level setting start with the fader in this position then adjust the input sensitivity control for the correct level to optimise the gain structure.

- 1 This is the **LONG FADER** which controls the level of the LF signal.
- 2 This is the **+10dB** mark. The fader is fully open at this point and introducing 10dB of gain into the signal path.
- 3 This is the **0dB** mark. This is the normal operation position for the fader.
- 4 With the fader here the signal path is closed and no signal will pass.

Console functions.



CHANNEL STRIP



- | | |
|---|--|
| 1 20 Segment meter (normally monitoring the DAW input) | 7 INSERT IN - places an insert point in the MIC/LINE path. |
| 2 3 Segment meter (normally monitoring the Mic/Line input). | 8 Mic/Line GAIN Control |
| 3 INSERT IN places an insert point in the DAW path | 9 \emptyset Polarity (Phase) Reverse Switch |
| 4 DAW Input TRIM control | 10 48V Phantom Power Switch. Turn the loudspeakers down before switching this on or off! |
| 5 MIC/LINE switch - press down to select the line input. | 11 High Pass Filter Switch. A high pass filter can be used to get rid of any unwanted low frequencies that may be present such as air conditioning rumble. |
| 6 MTR - press to show the mic/line input on the large meter and the DAW input on the small meter. | |

INPUT POD

The input pod is the gateway to the remainder of the signal processing of the console. There are three inputs, a mutually exclusive microphone and line input, and a tape input.

Note the different colouring used to identify the different signal paths of the pod. Anything on a light background is associated with the LF path while anything on a dark background is associated with the SF path.

The mic/line input normally sends signal to the SF or short fader signal path of the console while the DAW input normally sends signal through the LF or long fader path of the console unless this is reversed by the FLIP switch.

There are two meters associated with the inputs, a 20 segment 0dBFS peak reading meter showing the DAW input signal and a 3 segment peak reading meter gives an indication of the mic/line level.

Both the MIC/LINE and the DAW inputs have insert points which can be switched in and out of circuit.

The Mic Input has a gain control range of +6dB to +60dB and the Line Input has a range of -14dB to +40dB. Switches allow for Phantom Power, Polarity Reversal and High Pass filtering - enabling rumble and sources alignment issues to be easily dealt with.

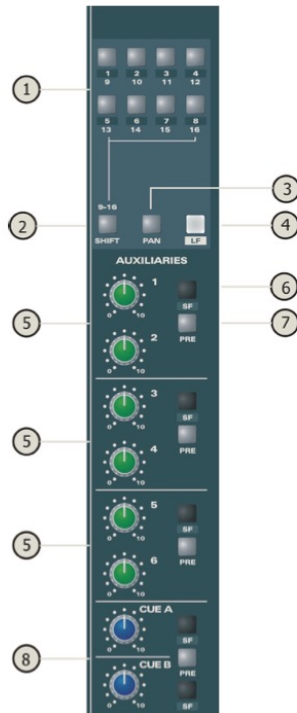
The DAW input has a trim control with a range of ± 15 dB.

There is a back illuminated number at the bottom of the pod for channel identification.

Console functions.



CHANNEL STRIP



- | | |
|--|---|
| 1 ROUTING SWITCHES select the bus outputs that the SF signal is sent to. The first eight switches also route to the 8 sub-groups | 5 LEVEL adjusts the level sent to an auxiliary output. |
| 2 SHIFT gives access to bus outputs 9-16. | 6 SF allows the signal feeding the auxiliary to be taken from the SF signal path. |
| 3 PAN allows the signal to be panned across odd and even buses. | 7 PRE allows the auxiliary signal to be taken pre fader instead of the normal situation where it is taken post fader. |
| 4 LF replaces the SF signal being sent to the routing switches with the signal from the LF signal path. | 8 CUE A and B are identical in operation to the others but can be individually switched into the SF path. |

ROUTING and AUXILIARIES

The routing section takes the signal from the SF path and routes it to the bus outputs which in turn are usually connected to the inputs of a DAW or other recording device. Buses 1 to 8 also have a parallel path and feed the 8 sub-groups. These can be used to pre mix channels together for final mix down or as sends to a DAW or other recording device.

There are 16 bus outputs accessed by 8 routing buttons and a SHIFT button.

Routing can be to multiple outputs and if odd and even outputs are selected panning can be used to place the signal within a stereo image.

With multiple buses available it is possible to achieve a variation on the multi-bus compression techniques made popular by mix engineers like Michael Brauer. (See www.mbrauer.com/articles).

The LF switch moves the routing from the SF path over to the LF path and can be useful for track bouncing. If PAN is down and routing is again selected for odd and even buses then the post fade post pan LF signal is sent to the bus outputs selected.

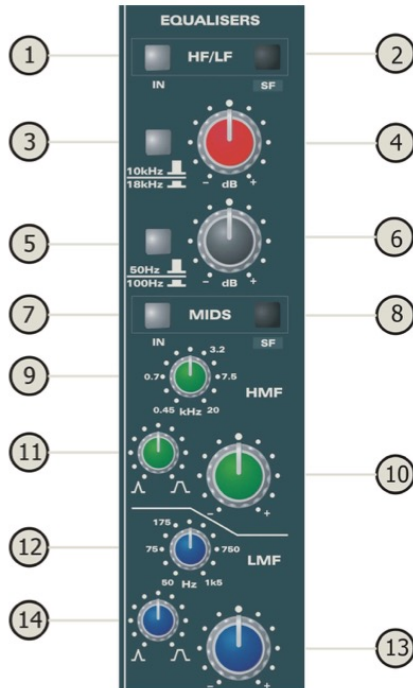
There are 8 auxiliary outputs. The Auxiliaries can be switched to the SF path.

Cue A and B work in the same manner as the other auxiliaries but are intended mainly for use as sends to the FOLDBACK system.

Console functions.



CHANNEL STRIP



- | | |
|---|--|
| 1 HF/LF Section. This places the HF/LF equaliser in circuit. | 8 SF places the MIDS equaliser in the SF signal path where it can be used to treat a signal before being recorded. |
| 2 SF places the HF/LF equaliser in the SF signal path where it can be used to treat a signal before it is recorded. | 9 This controls the centre FREQUENCY of the high mid equaliser. |
| 3 10kHz/18kHz allows the frequency of the HF equaliser to be selected. | 10 HIGH MID boost/cut control. |
| 4 HF boost/cut control. | 11 HIGH MID Q control. |
| 5 50Hz/100Hz allows the frequency of the LF equaliser to be selected. | 12 This controls the centre FREQUENCY of the low mid equaliser. |
| 6 LF boost/cut control. | 13 LOW MID boost/cut control. |
| 7 MIDS Section. This places the MIDS equaliser in circuit. | 14 LOW MID Q control. |

EQUALISER

Note the dark background indicating that the equaliser is normally associated with the LF signal path.

The equaliser is split into two sections - one for high and low frequencies (HF/LF) and the other for middle frequencies (MIDS). Both sections can be switched in and out independently and switched into the SF signal path independently.

The HF section has a boost/cut range of 15dB. The frequency can be switched - 10kHz with the switch up and 18kHz with the switch depressed.

The LF section has a boost/cut range of 15dB and a shelving characteristic. The frequency can be switched - 50Hz with the switch up and 100Hz with the switch depressed.

The high mid section (HMF) has three controls. The boost/cut range is 15dB and the frequency of operation can be varied from 450Hz to 20kHz. A Q control allows for a very sharp and narrow characteristic or for a more gentle characteristic covering a wider range of frequencies.

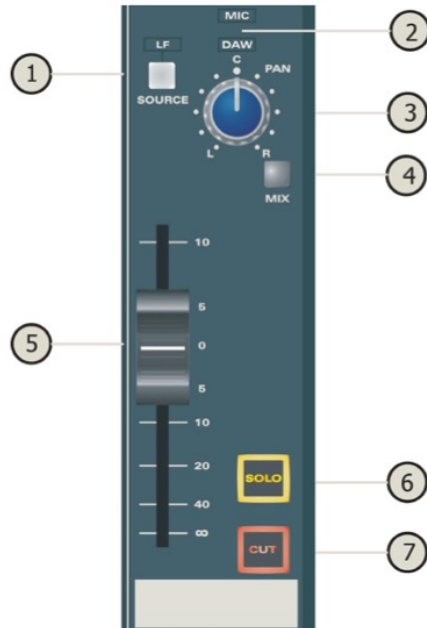
The low mid section (LMF) has three controls. The boost/cut range is 15dB, and the frequency of operation can be varied from 50Hz to 1.5kHz. A Q control allows for a very sharp and narrow characteristic or for a more gentle characteristic covering a wider range of frequencies.

The actual Q range is between 3.8 (0.4 Octave) and 0.65 (2 octaves).

Console functions.



CHANNEL STRIP



- 1 SOURCE selects the post fade LF signal as the input to the SF signal path, over-riding the MIC or DAW selection from the Flip switch. By altering a link on the circuit board this signal can be made pre fade. The LF legend will illuminate when the switch is pressed and the MIC/DAW indicator will blank.
- 2 MIC/DAW. These back lit indicators show whether the MIC/LINE or the DAW input is selected to the SF path. Only one will be illuminated and it can be changed by using the FLIP switch.
- 3 This is the PAN control for the SF signal enabling it to be panned across odd and even buses.
- 4 MIX routes the SF signal to the stereo mix bus. It is good practice to unroute any channels which are not needed. This will reduce mix amp noise.
- 5 This is the SHORT FADER which controls the level of the SF signal.
- 6 SOLO allows the SF signal to be heard on the monitors and viewed on the master meters. If Solo In Place is selected it will replace the console output.
- 7 CUT allows the SF signal path to be muted. This may help to reduce noise in a mix if a channel is not in use for a period of time.

SHORT FADER (SF)

There are 3 back illuminated indicators showing the selected input to the SF path. This can be changed between Mic/Line and DAW using the FLIP switch.

LF Source allows the source for the SF path to be taken from the LF path. This could be used during mixdown to send the LF signal through the SF path up to the routing matrix where the bus outputs can be used as additional effect sends. Normally this signal is derived after the long fader (POST LF) but it can be made PRE LF by changing an internal link on the circuit board.

The source switching occurs before the equaliser so it is possible to equalise the SF signal which has been taken from the LF path by switching either one or both equaliser sections into the SF path. (If this is done then the equaliser section is no longer available in the LF path).

The SF PAN control allows panning across the bus outputs when pan is selected on the routing section of the strip.

MIX allows the SF signal to be routed to the stereo mix bus and allows the SF path to be used as an additional input during mixdown.

The short fader is designed for use with 10dB of gain in hand allowing the signal to be boosted or reduced in level if required.

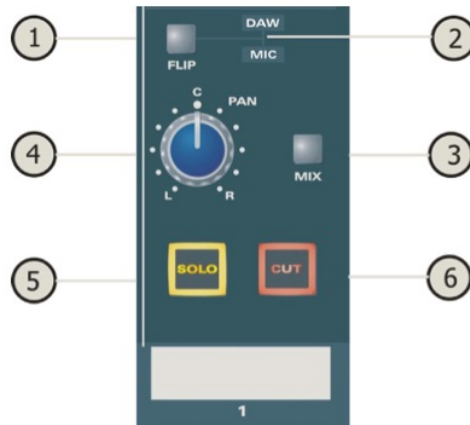
The SOLO switch allows the channel to be auditioned through the AFL/PFL or Solo in Place facilities.

CUT allows the SF signal path to be muted.

Console functions.



CHANNEL STRIP



- 1 FLIP swaps the inputs between the LF and SF paths.
- 2 These back lit indicators show whether the MIC/LINE or the DAW input is selected to the LF path. Only one will be illuminated and it can be changed by using the FLIP switch.
- 3 MIX allows the LF signal to be routed to the stereo mix bus. Normally this switch should be pressed but it is good practice to unroute any channels which are not needed. this will help to reduce mix amp noise.
- 4 This is the PAN control for the LF signal enabling it to be panned across the stereo bus
- 5 SOLO allows the LF signal to be heard on the monitors and viewed on the master meters or, if Solo in Place is selected, it will replace the console output.
- 6 CUT allows the LF signal path to be muted. This may help to reduce the noise in a mix when a channel is not in use for a period of time.

FLIP and PAN

The FLIP switch allows the MIC/ LINE input and the DAW input to be reversed. Normally the DAW input feeds the LF signal path - with FLIP pressed it will feed the SF signal path. The MIC/LINE input normally feeds the SF signal path and with FLIP pressed it will feed the LF signal path. Illuminated indicators in each section show which input is selected to the LF and SF paths.

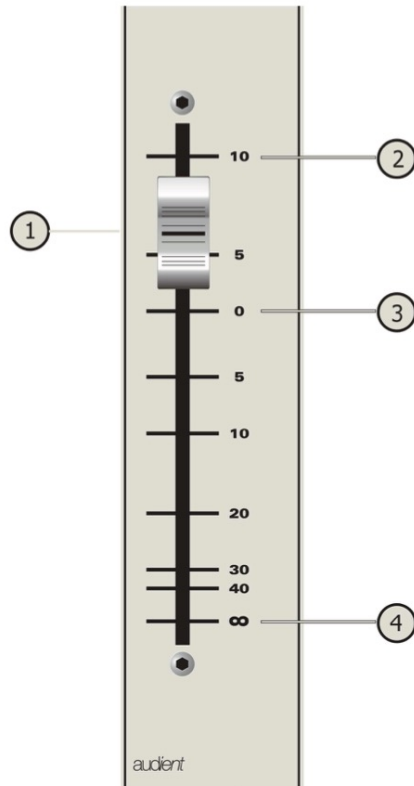
The PAN control pans the LF signal across the stereo mix bus and the MIX switch assigns the LF signal to the stereo bus.

The SOLO switch allows the long fader signal to be auditioned through the AFL/PFL or Solo in Place facilities.

CUT allows the LF signal path to be muted.

Page 33 gives more detail regarding the long fader used to control the level of the LF signal path.

CHANNEL STRIP



- | | |
|--|--|
| 1 This is the LONG FADER which controls the level of the LF signal. | 3 This is the 0dB mark. This is the normal operation position for the fader. |
| 2 This is the +10dB mark. The fader is fully open at this point and introducing 10dB of gain into the signal path. | 4 With the fader here the signal path is closed and no signal will pass. |

LONG FADER (LF)

Located close to the operator this fader operates on the LF signal path and is therefore mainly used for creating the monitor mix and the final stereo mix for the title.

The fader is expected to operate around the 0dB mark with 10dB of gain in hand allowing the signal to be increased or decreased in level.

When level setting start with the fader in this position then adjust the input sensitivity control for the correct level to optimise the gain structure.

Upgrade to get meaningful results: View all your responses and get powerful analysis. [View Pricing >](#)

Audio Console Interactive Manual Survey

SUMMARY → DESIGN SURVEY → COLLECT RESPONSES → **ANALYZE RESULTS**

CURRENT VIEW

+ FILTER + COMPARE + SHOW

No rules applied

Rules allow you to **FILTER**, **COMPARE** and **SHOW** results to see trends and patterns.

[Learn more >](#)

SAVED VIEWS (1)

Original View (No rules applied)

+ Save As

EXPORTS

SHARED DATA

No shared data

Sharing allows you to share your survey results with others. You can share all data, a saved view, or a single question summary.

[Learn more >](#)

+ Share All

RESPONDENTS: 27 of 27

Export All

QUESTION SUMMARIES

DATA TRENDS

INDIVIDUAL RESPONSES

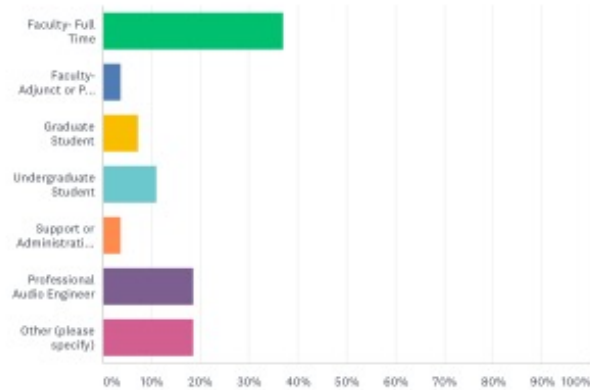
Page 1: Mark Harris MUS N518 Pilot Study Survey

Q1

Which of the following best describes you?

Answered: 27 Skipped: 0

Customiz



ANSWER CHOICES

RESPONSES

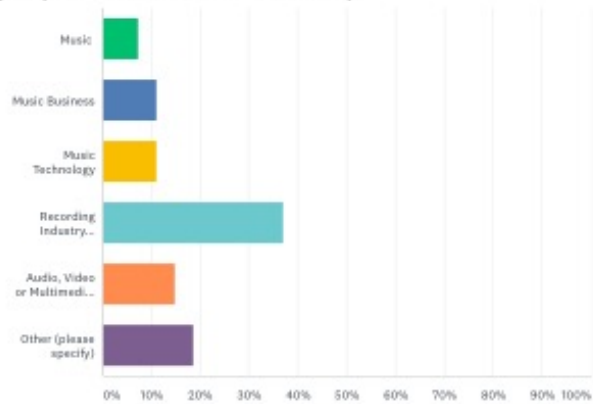
Faculty-Full Time	37.04%
Faculty- Adjunct or Part Time, including Teaching Staff	3.70%
Graduate Student	7.41%
Undergraduate Student	11.11%
Support or Administrative Staff	3.70%
Professional Audio Engineer	18.52%
Other (please specify)	18.52%
Total	

Q2

Which of the following best describes your department, degree or major?

Answered: 27 Skipped: 0

Customiz



ANSWER CHOICES	RESPONSES
▼ Music	7.41%
▼ Music Business	11.11%
▼ Music Technology	11.11%
▼ Recording Industry Studies	37.04%
▼ Audio, Video or Multimedia Production	14.81%
▼ Other (please specify)	Responses 18.52%

RESPONSES (5) TEXT ANALYSIS MY CATEGORIES

Categorize as...

Filter by Category

Search responses

Showing 5 responses

Music Entrepreneurship	7/26/2017 10:28 PM	View respondent
No longer in school	7/26/2017 1:52 PM	View respondent
Sound for theatre	7/13/2017 1:05 PM	View respondent
Psycho-Musicology	7/12/2017 7:55 PM	View respondent
Mass Communication	7/12/2017 9:44 AM	View respondent

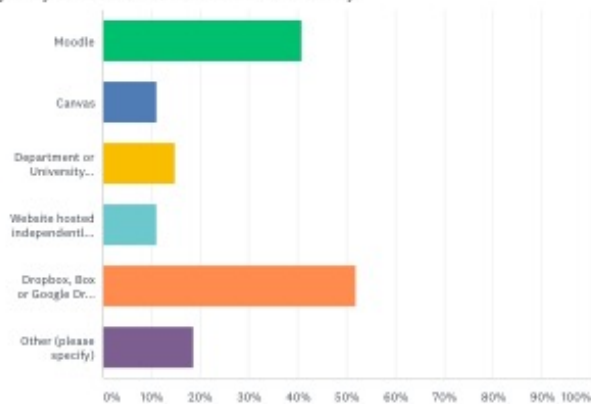
Total

Q3

Customiz

How does your program distribute supplemental course materials su
pdf files, web page links or tutorials? Check all that apply.

Answered: 27 Skipped: 0



ANSWER CHOICES	RESPONSES
▼ Moodle	40.74%
▼ Canvas	11.11%
▼ Department or University hosted website	14.81%
▼ Website hosted independently from the institution	11.11%
▼ Dropbox, Box or Google Drive Folder	51.85%
▼ Other (please specify)	18.52%

RESPONSES (5) TEXT ANALYSIS MY CATEGORIES

Categorize as...

Filter by Category

Search responses

Showing 5 responses

blackboard	7/27/2017 9:43 AM	View respondent
Blackboard	7/26/2017 10:28 PM	View respondent
handed out in class	7/22/2017 7:22 PM	View respondent
Blackboard	7/18/2017 9:30 AM	View respondent
Blackboard	7/12/2017 11:40 AM	View respondent

Total Respondents: 27

Q4

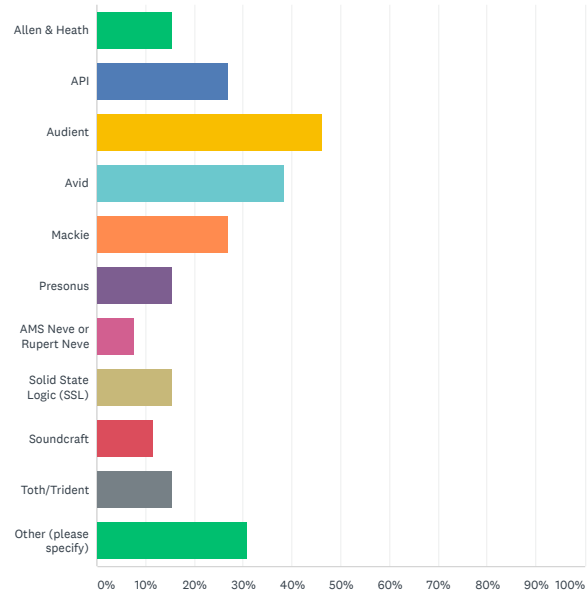
Customize

Which of the following Audio Consoles or Interfaces does your institution currently own and use in teaching audio production? Select all that apply.

Answered: 26 Skipped: 1

7/29/2017

SurveyMonkey Analyze - Audio Console Interactive Manual Survey



ANSWER CHOICES	RESPONSES
▼ Allen & Heath	15.38%
▼ API	26.92%
▼ Audient	46.15%
▼ Avid	38.46%
▼ Mackie	26.92%
▼ Presonus	15.38%
▼ AMS Neve or Rupert Neve	7.69%
▼ Solid State Logic (SSL)	15.38%
▼ Soundcraft	11.54%
▼ Toth/Trident	15.38%
▼ Other (please specify)	Responses 30.77%

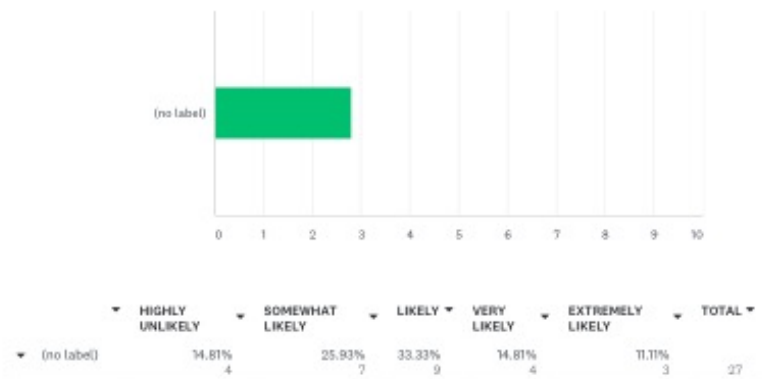
RESPONSES (8)	TEXT ANALYSIS	MY CATEGORIES
Categorize as...	Filter by Category	Search responses
Showing 8 responses		
Yamaha	7/28/2017 1:15 PM	View respondent's
Universal Audio	7/26/2017 10:28 PM	View respondent's
Apogee	7/21/2017 3:33 PM	View respondent's
Yamaha CL series	7/13/2017 1:05 PM	View respondent's
Lawa, Yamaha	7/13/2017 12:05 PM	View respondent's
Propellerhead, Ableton		View respondent's
Total Respondents: 26		

Q5

Customiz

Please go to the following link and download one of the pages from t Audient ASP4816 users manual and review it briefly. Audient 4816/8(Users Manual pdf pages (will open in a new window).After reviewing of the example pages, on a scale from 1 to 5 (where 1 is Highly Unlike is Extremely Likely) how likely would you be to use this as a supplem classroom instruction and hands-on learning of the channel strip of 1 Audient ASP4816 console?

Answered: 27 Skipped: 0



Q6

Please help us understand why you selected the answer above:

Answered: 26 Skipped: 1

RESPONSES (26)

TEXT ANALYSIS

MY CATEGORIES

Categorize as...

Filter by Category

Search responses

Showing 26 responses

It may be of some help, but I don't think that it is very useful.

7/28/2017 1:15 PM

[View response](#)

Some type of manual/written instruction is crucial to a hands-on learning process. Students must be able to go back and read interpret diagrams at their own pace, whereas hand-on instruction is much more tactile and can happen very quickly.

7/28/2017 9:32 AM

[View response](#)

It is info that is somewhat specific to a specific board and it is info that is readily available.

7/27/2017 9:43 AM

[View response](#)

We have our own materials for the hardware inn each room.

7/26/2017 10:28 PM

[View response](#)

I would refer to these documents if I needed a reminder on the operation of individual components, but would probably not be use this as a primary learning resource.

7/26/2017 1:52 PM

[View response](#)

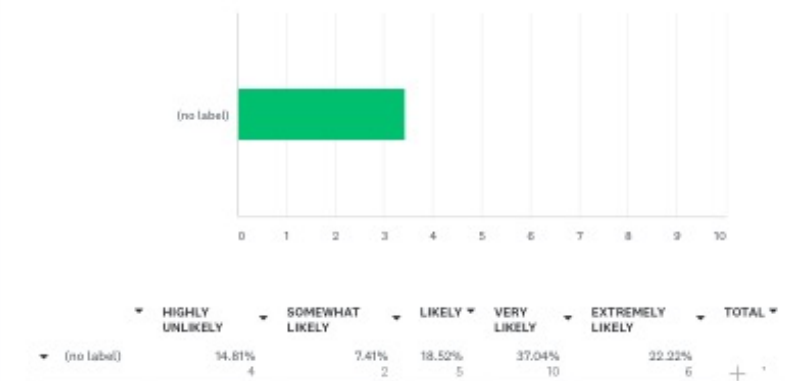
I would refer to these documents if I needed a reminder on the operation of individual components, but would probably not be use this as a primary learning resource.

Q7

[Customize](#)

Please go to the most recent version of the interactive photorealistic guide Audient Channel Strip Interactive Guide (will open in a new window) and click your way through interactive guide. In comparison to the previous version, on the same scale of 1-5 (where 1 is Highly Unlikely and 5 is Extremely Likely) how likely would you be to use this as a supplement to classroom learning and hands-on learning of the channel strip of the ASP 4816 Console?

Answered: 27 Skipped: 0



Q8

Please help us understand why you selected the answer above:

Answered: 27 Skipped: 0

RESPONSES (27)

TEXT ANALYSIS

MY CATEGORIES

Categorize as...

Filter by Category

Search responses

Showing 27 responses

If I had to learn this board. This was easy to navigate and gave me descriptions quickly.

7/28/2017 1:15 PM

[View response](#)

For studying purposes, this tool would allow students to "quiz" themselves. The visuals are also much easier to interpret and read student console's features

7/28/2017 9:32 AM

[View response](#)

It gives the student the ability to get the information in the sequence they need it.

7/27/2017 9:43 AM

[View response](#)

Although it's very well done, it's not relevant to us.

7/26/2017 10:28 PM

[View response](#)

This resource appears to me to just be a digitized, barely-interactive, version of the standard manual. I would probably use it referenced in the previous question.

7/26/2017 1:52 PM

[View response](#)

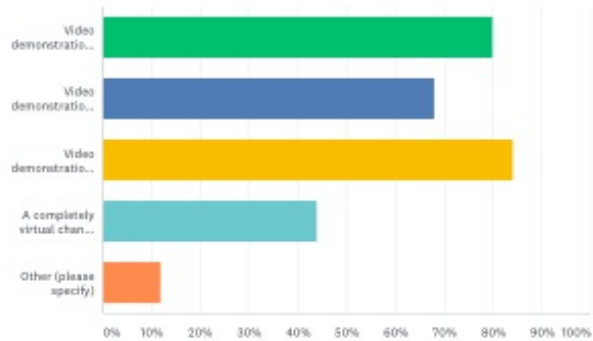
If I were teaching this console, I would definitely utilize something like this if it were available. It is more concise than the other

Q9

[Customize](#)

Which of the following additions within the guide would you find help demonstrating the features of this channel strip's functionality? Please all that apply.

Answered: 25 Skipped: 2



ANSWER CHOICES

▼ 8

- ▼ Video demonstration of using the "Channel Insert" in the Input Pod to add a compressor to the microphone signal + 8
- ▼ Video demonstration of using the "Cue A" and "Cue B" in the Auxiliaries to set up independent headphone mixes for artists when recording. ... 6

7/29/2017

SurveyMonkey Analyze - Audio Console Interactive Manual Survey

▼ Video demonstration of using the "Aux Sends" in the Auxiliaries to send the signal to an external processor such as a stereo reverb or equalizer?	8
▼ A completely virtual channel strip version using Cycling '74's MAX software in place of the html version tested.	4
▼ Other (please specify)	Responses 1
Total Respondents: 25	

Q10

Thank you for your time in participating in this pilot study and survey. Audient for their permission to use their materials and console as the basis for this project. Please add any feedback about this interactive guide supplemental material for audio production classes, other features you like to see, suggestions for improvement of this tutorial or any other equipment that you would like to like to see designed into similar app.

Answered: 9 Skipped: 18

RESPONSES (9) TEXT ANALYSIS MY CATEGORIES

Categorize as...

Filter by Category

Search responses

Showing 9 responses

View response	View response
Allen and Heath Qu-32, please	View response
7/18/2017 9:30 AM	View response
Interesting project.	View response
7/17/2017 7:41 PM	View response
Re: other audio equipment apps, perhaps a wireless mic receiver/transmitter interactive guide.	View response
7/13/2017 1:05 PM	View response
I wouldn't say no to any additional resources for teaching, applying as many different learning style accommodations as possible and explicit demonstrations are very useful for some students. Interactive simulations are great for others. Some will dig into written materials, others learn by doing. Students benefit when they are able to learn material in a way that makes sense to them.	View response
7/13/2017 12:05 PM	View response
Great job and useful product for teachers, students, and maybe Audient!	View response
7/11/2017 10:14 PM	View response

ENGLISH

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+

https://www.surveymonkey.com/analyze/DDLYJUS8PqQbn13dJBp8vuquzNTcmwBKc5rucjACvCL_3D

8/8